TECHNOLOGY DEPT.

FEBRUARY 1952

FOUNDRY

...WHEREVER METALS ARE CAST

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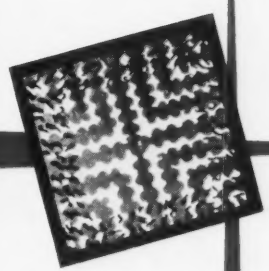

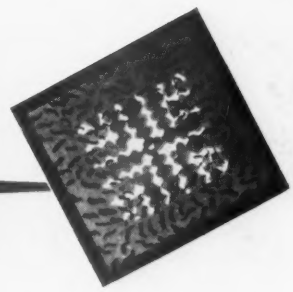

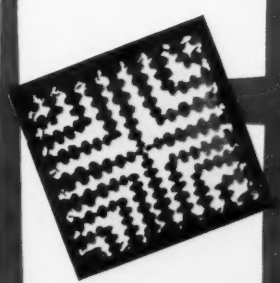

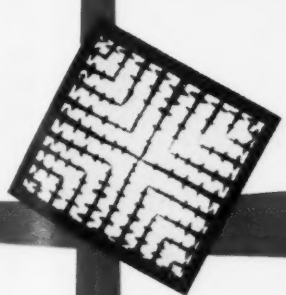

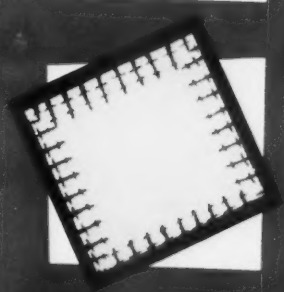

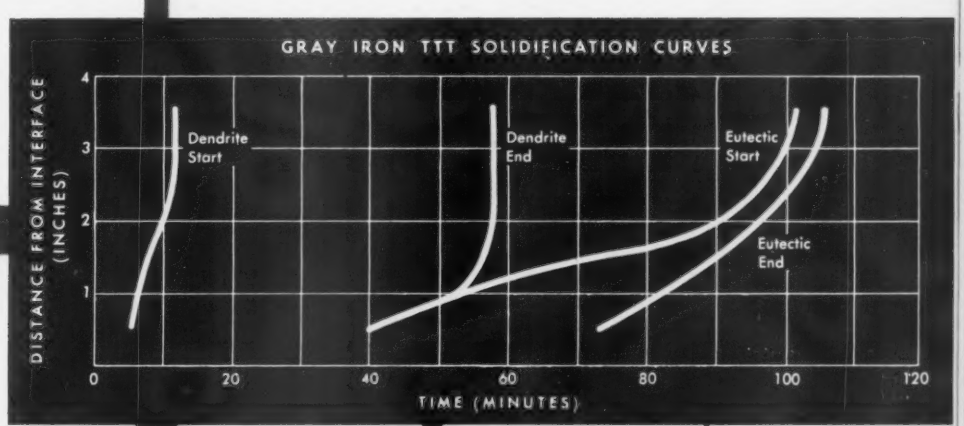

SOLIDIFICATION OF METALS

—see page 86

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refine with PURITE

FOR CLEANER...SOUNDER IRON CASTINGS

St. Louis Plant of American Car and Foundry Company

where quality castings are made for modern heavy railroad equipment.

To produce the best castings possible, leading foundries like the American Car and Foundry Company refine their iron with Purite. Applicable both as a cupola flux and as a ladle desulphurizing agent, Purite has won industry-wide acceptance because:

- **Purite gives 100% fluxing action in the cupola — 100% desulphurizing action in the ladle.**
- **Purite gets to the iron quicker — no faster desulphurizer made.**
- **Purite is time-tested and proven for unsurpassed desulphurizing uniformity.**
- **Purite comes in 2-lb. pigs — no weighing or measuring required.**
- **Purite is 100% fused soda ash — you do not pay for inert materials.**
- **Purite does not crumble — no waste — no dust.**
- **Purite can be shipped in bulk carloads at substantial savings over bag shipments — is easily stored without deterioration.**

These advantages and many more, proved through its everyday use in iron foundries, have made Purite the universal cupola flux and ladle desulphurizing agent.

A new booklet, "Refining and Desulphurizing Cupola Iron," illustrates in detail the accepted ways in which Purite is most effective. Write for your copy today. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE — 100% Fused Soda Ash. The Scientific Flux for Better Melting and Cleaner Iron.

PURITE — is sold by all leading foundry supply houses in the United States and Canada.

Mathieson
CHEMICALS

8949

SERVING INDUSTRY, AGRICULTURE AND YOUR HEALTH

DUCTILE IRON Improves Diesel-Engine Pistons

50-pound piston cast in Ductile Iron. At the left is a section. Tests show:

TENSILE STRENGTH . . . . . 65,000 p.s.i.
YIELD POINT . . . . . 53,000 p.s.i.
ELONGATION 9.5%

Hydrostatic Destruction test over 18,000 p.s.i.
(Same test on Class 40 iron — 13,000 p.s.i. ultimate.)

Provides High Strength/Weight Ratio along with Outstanding Resistance to Mechanical Wear and Heat

Ductile Iron is a cast ferrous product that combines the *process advantages* of cast iron along with many of the *product advantages* of cast steel...

In less than two years, Ductile Iron has attained wide acceptance because it offers excellent castability, high mechanical properties, and good machinability. Parts cast in Ductile Iron show superior pressure tightness, good elastic modulus and resistance to shock.

High yield strength in combination with toughness renders this new engineering material ideal for automotive and allied services.

TYPICAL CURRENT APPLICATIONS: crankshafts, wrenches, manifolds, fender dies, pumps, clamps, compressor heads, anvil blocks for forging hammers, and other parts too numerous to detail.

YOUR OPPORTUNITY: Join the increasing number of successful foundries now producing Ductile Iron. Write for additional information on the production advantages and types of castings for which Ductile Iron has been adopted... mail the coupon now.

EMBLEM OF INCO SERVICE

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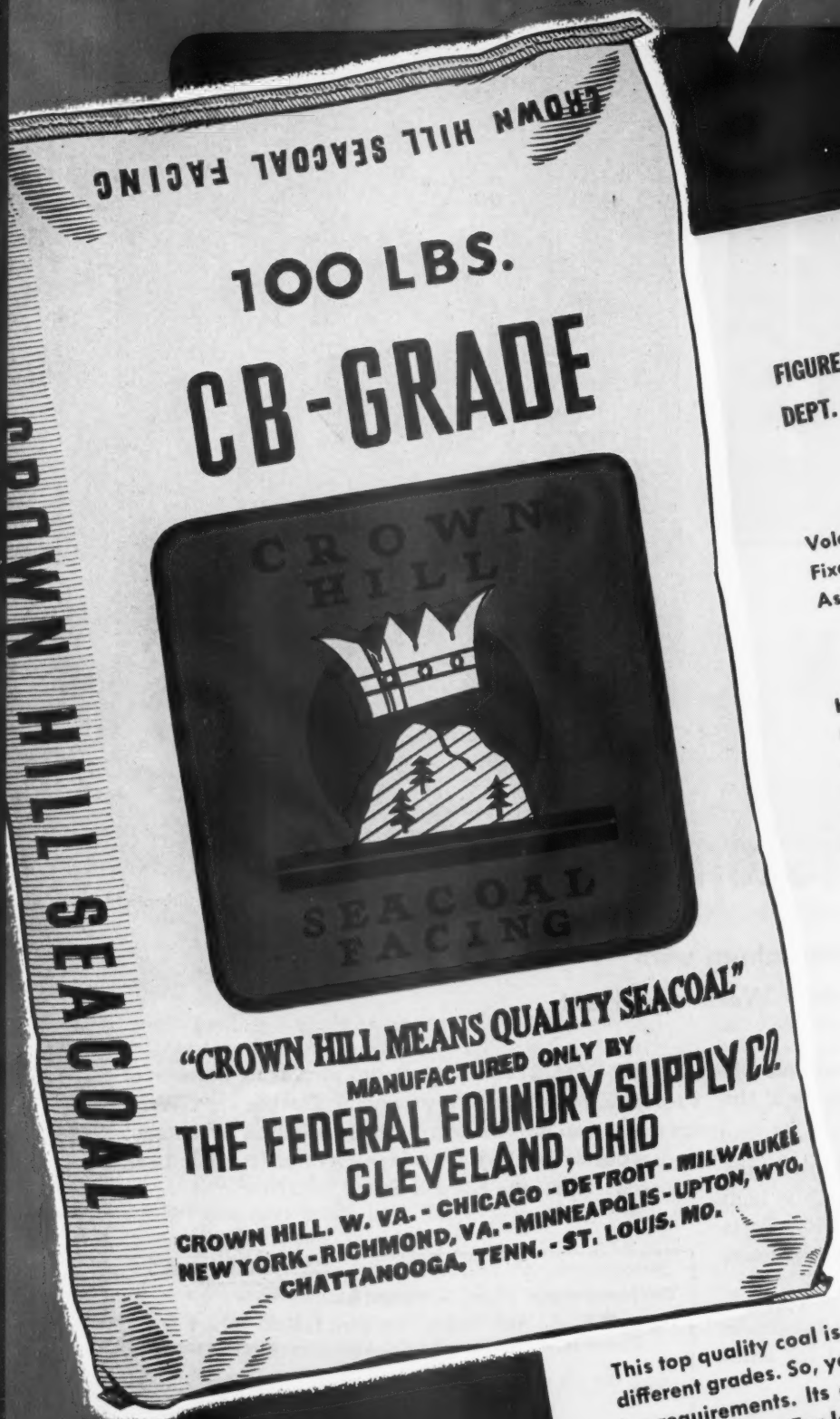
CROWN HILL MEANS *Quality* SEACOAL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CB-GRADE
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"CROWN HILL MEANS QUALITY SEACOAL"
MANUFACTURED ONLY BY
THE FEDERAL FOUNDRY SUPPLY CO.
CLEVELAND, OHIO
CROWN HILL, W. VA. - CHICAGO - DETROIT - MILWAUKEE
NEW YORK - RICHMOND, VA. - MINNEAPOLIS - UPTON, WYO.
CHATTANOOGA, TENN. - ST. LOUIS, MO.

FIGURES FROM BUREAU OF MINES, DEPT. OF INTERIOR OF THE U. S.

(Moisture Free)

PROXIMATE ANALYSIS	
Volatile Matter	38.9%
Fixed Carbon	57.4%
Ash	3.7%
	100.0%

ULTIMATE ANALYSIS	
Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
	100.0%

Fusion Point of Ash 2980° F

The quick-flash coal used in producing CROWN HILL comes from the heart of the West Virginia bituminous coal region.

This top quality coal is carefully pulverized and screened into seven different grades. So, you're sure to find a grade to meet your particular requirements. Its quick combustibility induces faster escape of gas and steam. For lower cleaning costs and better finish—always specify CROWN HILL.

THE FEDERAL FOUNDRY SUPPLY COMPANY

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Mines—UPTON, WYO. • RICHMOND, VA. • ST. LOUIS • CHATTANOOGA • NEW YORK

FEBRUARY 1952

FOUNDRY

VOLUME 80—NUMBER 2

NBP ABP CCA

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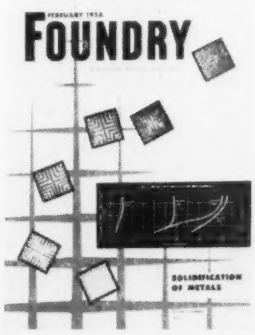

THE COVER: A dendrite comprises the background for one of several new solidification curves developed at the Naval Research Laboratory, Washington (page 86)

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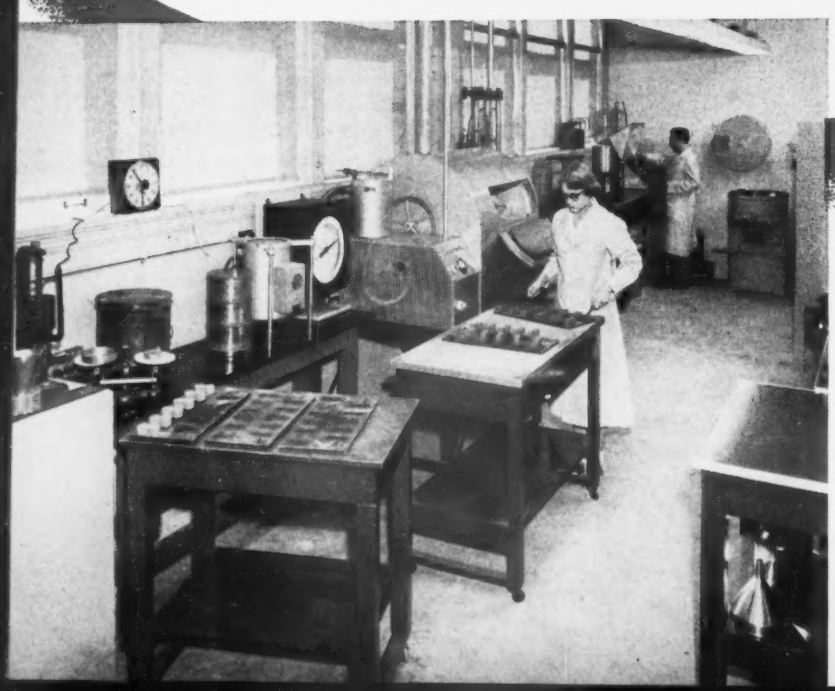
LINOIL

CORE OILS

PRODUCE

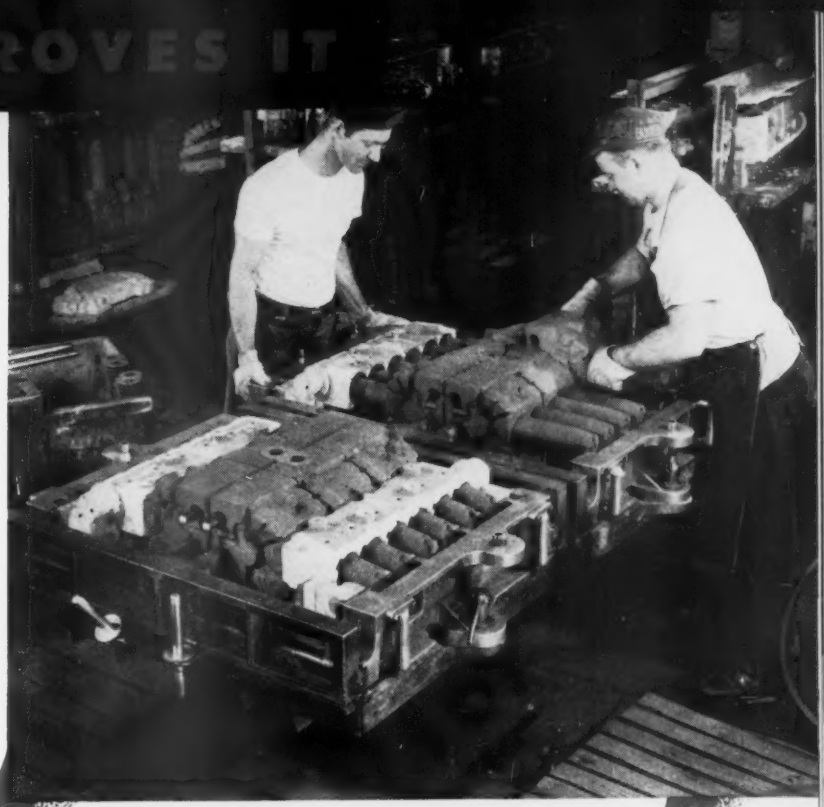
Better Cores at Lower Cost

WE PROVE IT



Linoil Research continually examines and evaluates new materials for use in improving core binders. When a material looks promising, it is sent to ARCHER-DANIELS-MIDLAND Sand Laboratories for a thorough observation in all core properties, permeability, flowability, green and baked strength, collapsibility, and many others. Once the new grade of LINOIL has been developed, manufacturing control laboratories in each of the three LINOIL plants make certain that chemical and physical specifications are never varied. No matter what grade of LINOIL you specify, you are assured consistent performance from the best core oil you can buy.

STUDEBAKER PROVES IT



Many automotive foundrymen consider the core room to be the most important department in the foundry. Cores aren't responsible for all the problems of the molding and cleaning departments, but a smoothly operating core room does mean far fewer headaches in the rest of the shop.

Like most automotive foundries, Studebaker uses LINOIL. They find that LINOIL gives them good, useable cores at a low cost. And they know that once careful controls are established on any core job, LINOIL can be depended upon to give uniform results.

YOU CAN PROVE IT

Ask your LINOIL representative to give a demonstration with your core work right in your own foundry. He'll select the grade of LINOIL that's best for your conditions, then show you how your cores can be made to do a better job at a lower cost, with LINOIL core oils. And if you've got a particular core problem that's hard to solve, he'll be glad to help you work it out.

Have you heard about the New LINOIL 700 Core Oils?

Here are the facts: No matter what core oil you are now using, you can replace it with one of the newly-developed LINOIL 700 Series and get greater tensile strengths *at a lower cost.* The LINOIL 700 core oils are easy to work with, too. They're proving to be the best core oil buy in the history of the foundry industry. Ask your LINOIL man about the "700 Series"—or write for further information.

ARCHER • DANIELS • MIDLAND COMPANY

FOUNDRY PRODUCTS DIVISION • 2191 WEST 110th STREET • CLEVELAND 2, OHIO

Experienced Foundrymen Know—

PANGBORN DUST CONTROL saves money, boosts efficiency!

Big Pangborn "CH" Dust Collector serves Garden City Foundry's grinding wheels and blast cleaning machines in Stoughton, Wisconsin.

Pangborn Dust Control at Flury Foundry, Lancaster, Pa., stops dust caused by blast cleaning operations.

EVER stop to think how much of your profits are lost as "dust"? And how this loss can be stopped, when the "dust" it collected at the source? That's the job Pangborn Dust Control does for you! It pays off in increased profits due to better worker efficiency, better products —and often, additional revenue from material salvaged from the "dust".

For example, a Pangborn "CH" Dust Collector at the Penn Steel Castings Co., Chester, Pa., protects blast cleaning equipment from excess abrasive dust and furnishes employees a dust-free working area! Both add up to considerable savings for Penn!

And at Flury Foundry, Lancaster, Pa., Pangborn actually pays its own way . . . a result of increased efficiency brought about when dust caused by blast cleaning operations was eliminated *right at the source!*

These are just two of the companies using Pangborn Dust Collectors to solve dust problems and increase profits. Whether your particular dust problem is the result of blast cleaning operations, finishing processes, or other causes that can be stopped at the source, Pangborn will save you money!

GET THE FACTS about Pangborn Dust Control today. Write for free Bulletin No. 909A to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn **DUST CONTROL**

STOPS THE DUST HOG from stealing profits

ADVERTISEMENT

If you haven't heard it . . . IT'S NEWS!

SAFETY NOTE FOR WINTER MONTHS: if you don't want to slip, watch out for ice—and what you mix with it.

* * *

THE WAY TO FIGHT A WOMAN is with your hat: grab it and run.

* * *

POEM: When you say that you've troubles as great as my own, I'm forced to admit that it's true; but consider the fact that mine happened to me! While yours merely happened to you.

* * *

LOTS OF INTERESTING NEW DEVELOPMENTS these days, with American industry retooling all along the line. But one of the most noteworthy is the 1952 model dŏnut featuring the smaller hole. Donut producers have decided that reduction of the hole size from seven-eighths inch to three-eighths makes for better handling and greater ease of dunking.

* * *

SMOKERS, as well as dunkers, face a bright future. In addition to the much heralded self-lighting cigarettes, we now get wind of a new cigar not only with limited nicotine content but enriched with vitamin-B complex!

* * *

FRIEND OF OURS BACK HOME writes that what worries him is the amount of money that is taken out of his take-home pay after he takes it home.

* * *

SPEAKING OF INFLATION, about the only way to double your money these days is to fold it once and put it in your pocket.

* * *

WE ADMIT the price of Pangborn products has gone up like everything else. But everything considered, Pangborn Rotoblast is a better deal than ever. The Big Idea is that our machines are *specially designed to increase your output per man-hour —and a man-hour costs you more today than ever before.* Let's face it: high labor costs are going to be with us from now on. *So write or phone today* for details on Pangborn Rotoblast and how it can save you thousands of dollars per year in labor costs alone.

* * *

LIVE AND LEARN is okay except that by the time you learn it's too late to live.

* * *

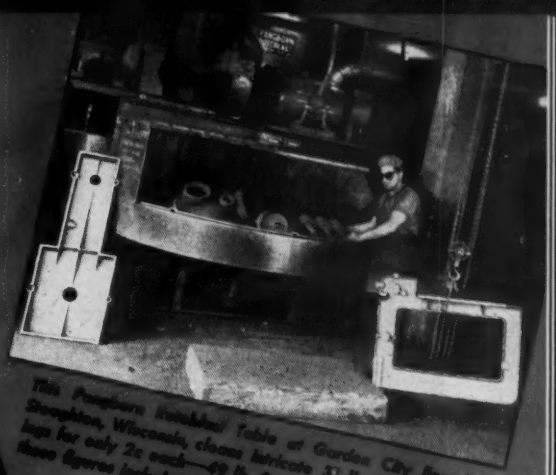
SEEMS STRANGE how a woman who has been 26 for the past eight years can accuse a used car dealer of dishonesty just because he set a speedometer back a few miles.

* * *

ELECTION YEAR. In America every boy has a chance to grow up and be President—and it's just one of the risks he has to take.

Experienced Foundrymen Know—

PANGBORN ROTOBLAST* *speeds production!*



This Pangborn Rotoblast Table at Gurdon City Foundry, Stoughton, Wisconsin, cleans intricate 32 lb. flywheel castings for only 2c each—49 lb. flywheels at 5.3c each! And these figures include all labor, power and operating costs!

General Foundries, Milwaukee, uses this Rotoblast Table-Room to clean the entire output of an air blast room in 40% less time than before . . . with practically no breakage of delicate castings.

This Rotoblast Room, used with a rotative table at Harris-Seybold, Cleveland, enables one man to handle all the work easily . . . representing savings in time, labor and money.

This Rotoblast Barrel, teamed with a Rotoblast Table and an Air Blast Room, gives Olney Foundry Co., Phila., an output of 1000 tons monthly. Cleaning time has been cut at least 75%!

No matter how large or small, heavy or light your castings, Pangborn Rotoblast can clean them faster, better and cheaper. There's a model and type of Rotoblast unit for every application!

Whether your cleaning requirements call for a Rotoblast Room, Table, Barrel or Table-Room, you'll save money five different ways: *Labor costs go down* because one Rotoblast machine and operator can do as much as a two-man crew and old-fashioned equipment. One Rotoblast machine often replaces five or more old machines, *saving space*. Rotoblast *cuts cleaning time* up to 95.8% over old-style methods. Cutting tools *last up to ⅔ longer* on work cleaned with Rotoblast. And *only 15 to 20 h.p.* is required for Rotoblast, compared to 120 h.p. for old-fashioned equipment.

Get the facts now on how Pangborn can *speed production* and *increase profits* for you. Write for free Bulletin No. 214 to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

OVER 28,000 PANGBORN MACHINES SERVING INDUSTRY

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

*Trademark of the Pangborn Corporation

MEMBER FEMA

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

Herman MOLDING

The Cooper Alloy Foundry Co.

THIS FOUNDRY IS
A Good Place to Work

FEMA

1500 POUND MACHINE

Located in Hillside, New Jersey, this foundry is the world's largest devoted exclusively to the casting of stainless steel.

Melting capacity exceeds 1,000,000 lbs. per month. Plant facilities cover three acres.

It is a good place to work because of the Company's insistence on high quality production accomplished through the best of employee working conditions, advanced design engineering, metallurgical science and rigid control.

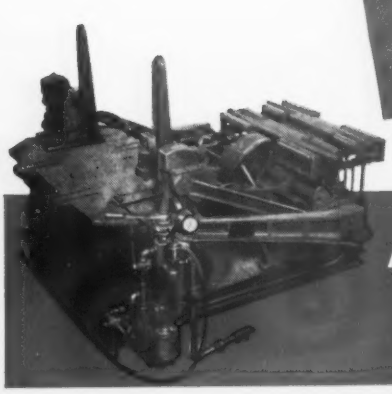
Each step in Cooper Alloy production is handled by skilled craftsmen, working together in a well-integrated organization. Mechanical and chemical testing methods are used extensively.

The plant is clean and mechanized.

Herman Molding Machines are used in this plant to help assure smooth, uninterrupted production. Like the 1500 # series machine illustrated, Hermans everywhere contribute to good working conditions through their simplicity of operation, automatic features, and rugged construction. They've made their way by the way they're made for 50 years.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.



At Cooper Alloy and other foundries everywhere, Herman Moldi
Machines have made their way by the way they're made.

The ad reproduced herewith originally appeared in the June, 1950 issue of FOUNDRY.

MACHINES

help make this Foundry a good place to work because

Mr. D. W. Talbott,
Vice President, Operations
The Cooper Alloy Foundry Co.
Hillside, New Jersey

"HERE at Cooper Alloy, with the help of Herman Molding Machines, we are able to produce more accurate mold castings at a rate far beyond what could possibly be done by hand. Also, we eliminate hand cutting of gates with its resultant danger of loose sand being washed into the castings.

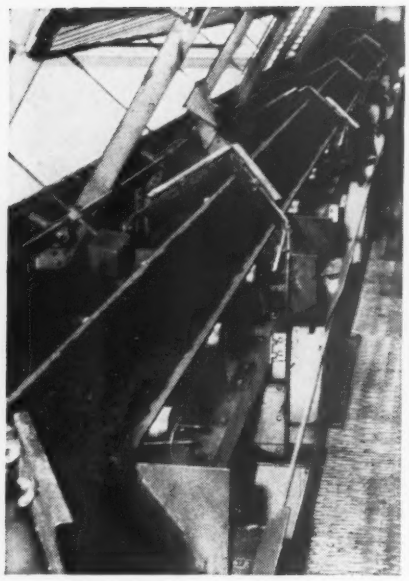
The Herman machines are very adaptable for production foundries since they are very simple to operate and have the advantage of single valve control. The simple air clamps for holding down the flasks and the relative ease with which patterns can be changed, as well as overall operational ease, has made the Herman machines very popular with our operators.

Our maintenance cost is very, very low. One machine, operating for 9 years, is still giving satisfactory service."

That's what Mr. Talbott, Vice President in charge of Operations, at The Cooper Alloy Foundry Co., Hillside, N. J. has to say about the operating efficiency of Herman Molding Machines.
They'll work just as efficiently in *Your* plant.

Herman **MOLDING MACHINES**

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



How Landis Tool reduced costs on sand conveying

■ The belt pictured here is one of six Standard Sahara distributor belts in service at Landis Tool Co., Waynesboro, Pa., manufacturers of precision cylindrical grinding machines. Installed December 12, 1946, this belt is still good for several years of service. Landis reports these belts handle sand at lower cost than any belts they have ever used.

Trouble-free Service

Imperial's Standard Sahara Belts are built for trouble-free service. Base fabric is heavy, tight-woven 37½-ounce silver duck — double-stitched to positively prevent ply separation. Special impregnation preserves and waterproofs the belt, increases its resistance to abrasion, and gives the belt pliability.

Other Foundry Uses

Standard Sahara Belts are also widely used in foundry service for handling hot shakeout sand, as magnetic separator belts, and for conveying hot core sand. Other Imperial belts will handle hot materials up to 600°.

Tell us your problem and we'll give you our recommendations. Write for Data Sheet 47-8.

Imperial
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

With the EDITORS

IN High Places: Foundrymen everywhere have a great feeling of pride in the recent election of William J. Grede as president of the National Association of Manufacturers. Bill, who is president of Grede Foundries Inc., Milwaukee, is well known and highly respected in the industry as a fine foundry operator and a leader in many co-operative activities looking toward the betterment of operations in the production of castings.

Starting in 1920 with the Liberty Foundry Co., Wauwatosa, Wis., and a yearly production of around 540 tons, he has expanded operations until today Grede Foundries operate five plants in Wisconsin and one in upper Michigan, producing both gray iron and steel castings. The firm now employs 1100 men and women and produces approximately 33,000 tons of castings a year. Bill has been a pioneer in establishing good employee relations. For example, he started group life insurance in the company in 1924, paid vacations in 1926, sickness and accident insurance in 1927, and later a pension plan with retirement benefits for all personnel.

Back in the twenties Bill was president of the Wisconsin Gray Iron Foundrymen's Association, and a member of the organizing committee of the Wisconsin Gray Iron Research Group, an organization designed to further foundry research at the University of Wisconsin at Madison. He was active in the organization of the Gray Iron Institute, predecessor of the Gray Iron Founders' Society, served on first and several subsequent boards of that organization. His company also holds membership in the Gray Iron Research Institute, Steel Founders' Society of America, American Foundrymen's Society and American Society for Testing Materials. He was active in the organization of Wisconsin Chapter of AFS.

Congratulations, Bill, on achieving the high honor that goes with the presidency of NAM. And we know that the organization will benefit greatly through your leadership.

—o—

Who Sees It? When we write an editorial which is critical of government action in relation to the foundry industry, many readers comment favorably. But many probably wonder if the message will reach government people in position to do something about the problem. An answer to the question of who sees the editorial comment may be found in an item which appeared in the Friday, Dec. 7 issue of the National Production Authority's "Daily Information Digest," which is prepared for all DPA and NPA officials. The item, presented under the heading of "Security" is as follows:

"FOUNDRY (Dec., p. 91) editorial assails procedures set up by DPA-NPA for handling of *security information* . . asks, 'Why are such high-sounding phrases and an elaborate committee setup necessary if "proper safeguards have been followed" in handling security information?' . . . 'Experience has shown that the backwash of these so-called security orders extends far beyond the protection of military secrets. . . for example, the long-standing practice of defense agency men being permitted to accept invitations to attend industry meetings and discuss mutual problems developing from government actions and controls changed considerably immediately after the gag order was announced' . . . citing several examples of this 'change,' editorial says chief of NPA Equipment and Supplies Section 'was not permitted to attend' the annual meeting of Foundry Equipment Manufacturers' Assn. . . 'emphasis on security can be the excuse to cover up mistakes within government agencies.' "

—o—

Molding Lives: During the summer we received several very interesting letters from the Rev. Fred Stanton, Monroeton, Pa., a former foundry worker who now serves as minister to three rural churches in the area.

(*Concluded on page* 12)

MEMBER
Foundries Need Scrap
Keep it Moving

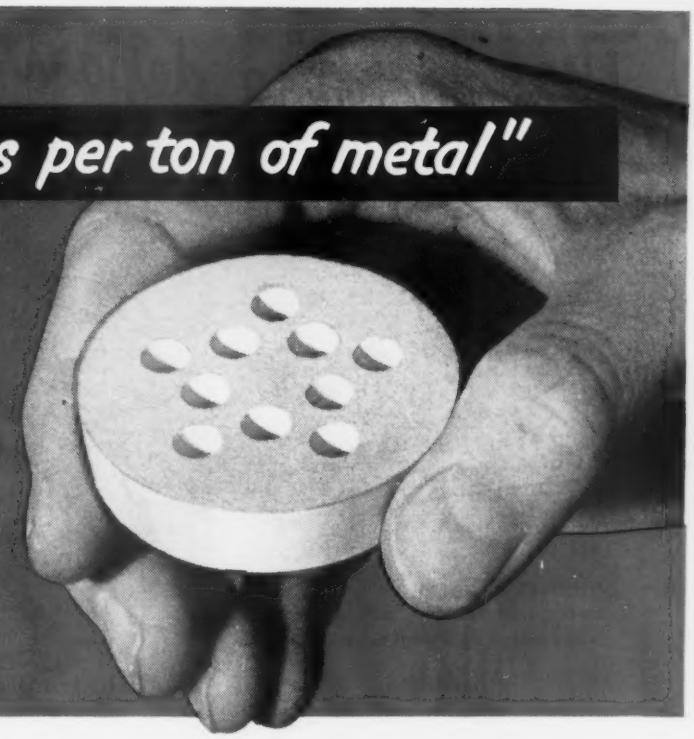
Members of the Gray Iron Founders' Society currently are using this sticker to call attention to the need of foundries for scrap metal

Users say—

"More good castings per ton of metal"

with

HARBISON-WALKER REFRACTORY STRAINER CORES



Reports from users of Harbison-Walker Refractory Strainer Cores tell us:

"Tests with H-W Strainer Cores resulted in standardizing on type SC 075. We now get an even flow of metal into the mold; no wash from the cores."

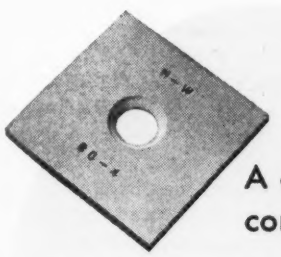
"The use of Harbison-Walker Strainer Cores has resulted in the most perfect bronze castings we have obtained in years. There have been practically no losses." (For a non-ferrous alloy subject to very close inspection.)

They reduce scrap loss to a minimum." (From a foundry using several thousand Strainer Cores per day.)

". . . with Harbison-Walker Strainer Cores we make cleaner castings. In fact, on one particular job we found it almost impossible to make a clean casting without type SC 063."

"The use of Harbison-Walker Strainer Cores for castings weighing 165 to 290 pounds has resulted in a reduction from 12% down to 3% in the amount of chipping, welding and grinding of defective surfaces due to sand and slag inclusions."

Under present conditions, the value of Harbison-Walker Refractory Strainer Cores becomes increasingly evident. Not only do you save money and labor, but the reduction of rejects increases production.



A cost-reducing companion . . .

Refractory Breaker Cores

Harbison-Walker Refractory Breaker Cores save time and money in the cleaning room by providing necked-down risers that are quickly and easily removed.

Made in ten sizes, packed in handy cartons, ready to use. These refractory cores are prefired and do not generate gas to cause trouble in the mold. For cleaner castings, faster production and saving of materials, use Harbison-Walker Refractory Breaker Cores.

HARBISON-WALKER REFRACTORIES CO.
Pittsburgh 22, Pennsylvania

Please send me complete information on:

☐ Refractory Strainer Cores
☐ Refractory Breaker Cores

Name_____ Position_____

Company_____

Address_____

HARBISON-WALKER REFRACTORIES COMPANY
AND SUBSIDIARIES

WORLD'S LARGEST PRODUCER OF REFRACTORIES

General Offices Pittsburgh 22, Pa.

The grinding department has them stepping!

SIMONDS ABRASIVE CO.

Grinding Wheels

More assemblers needed . . . and it's simply a matter of cause and effect. The cause—Simonds Abrasive Company Grinding Wheels! The effect—more production turned out faster. Put more "prod" in *your* production with Simonds Wheels. They're part of a complete line including grinding wheels of all shapes and sizes, mounted wheels and points, segments and abrasive grains . . . accurately specified for your jobs . . . and made by Simonds Abrasive Company, a major grinding wheel producer for almost 60 years. Write for grinding data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

Reverend Stanton tells us that during his association with the foundry industry he worked as electrician at a number of plants, as master mechanic with an alloy producer and as plant engineer with a stainless steel foundry. As his training was along those lines, he followed engineering work while supplying various pulpits of the Methodist church in the absence of regular ministers. After their children were married, Reverend and Mrs. Stanton decided to enter the field of religious work on a full-time basis, and were assigned to the charge they now serve. Reverend Stanton says he is "still molding, not with sand, either dry or green, but with the aid of God's help and his work, is endeavoring to mold men's lives." He has invited us to stop in for a visit if we drive through that part of beautiful and scenic Pennsylvania, and we are sure the invitation is extended to any foundryman.

We almost forgot to mention that he wrote us first to subscribe to FOUNDRY, since he came to enjoy the publication during his association with the foundry industry, and would be lost without it.

—o—

Where You Find It: For many years, FOUNDRY has presented an accurate picture of its distribution and readership through the slogan "wherever metals are cast" which appears under the masthead of this issue. Recently the editors were discussing the length of time this slogan has been in use, and all agreed it antedates the oldest editor on the staff. So we checked back, and found it was first used in the September, 1910 issue in connection with the promotion work of the circulation department. Perhaps the story of FOUNDRY and its readers was presented a little more clearly in the early version, which was "Wherever metals are cast you will find the FOUNDRY."

—o—

Castings Are Best: A paragraph from a recent news release of the United States Radiator Corp., Detroit, gives an interesting slant on why cast iron radiation is best:

"The preference for cast iron radiation is due to its 'radiant warmth and long life.' Also, because of the heat-holding properties of cast iron radiation, room temperatures do not tend to fluctuate. These advantages account for the fact that year after year millions of square feet of cast iron radiation are sold for radiation in residences, commercial buildings, industrial plants and public and institutional buildings." F.G.S.

Lighter . . . faster Rotor grinders

"PAID OFF" in 48 days

JOB: Grinding welds on truck cabs. Using slow, 20-pound electric grinders. Only 2800 r.p.m. under load.

SOLUTION: Rotor Application Engineer suggested changing to Rotor 6" Air Grinders that weigh only 9¾ pounds. Speed 5300 r.p.m. under load.

RESULTS: Stepped up metal removal, increased wheel life. Lower maintenance. Cut man-hours per cab. Savings "paid off" cost of Rotor Grinders in 48 days—on basis of 50% use factor.

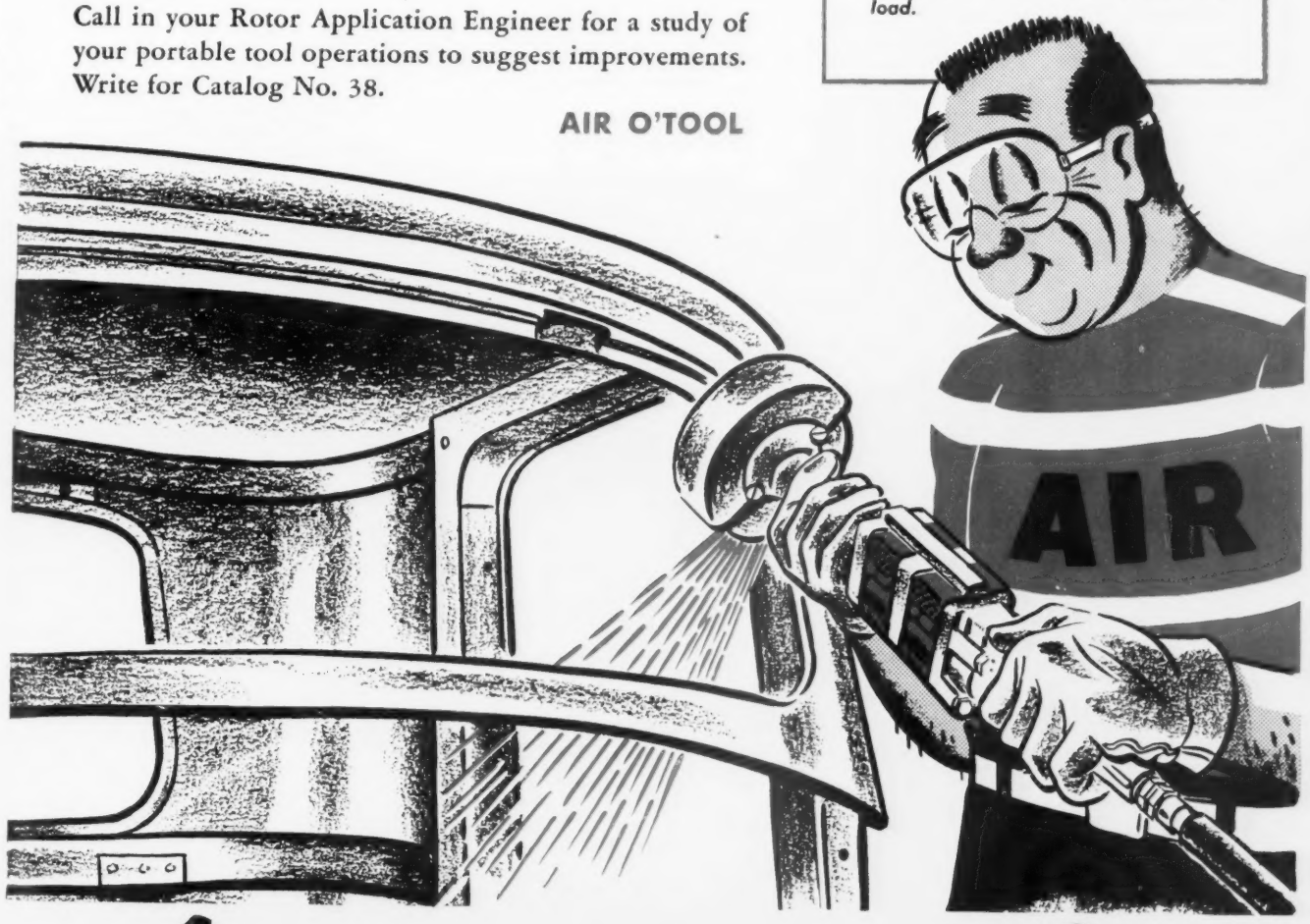
Call in your Rotor Application Engineer for a study of your portable tool operations to suggest improvements. Write for Catalog No. 38.

AIR O'TOOL

ROTOR GRINDER FACTS

LIGHTER . . . Unique two-blade design and magnesium handles. Easy to move around. 6" Rotor Grinder weighs only 9¾ lbs. . . . 8" only 11¼ lbs.

FASTER . . . Rotor Grinders, known as the "Power Plus" line are recognized everywhere for their high speed *under load.*



AIR

THE ROTOR TOOL CO.

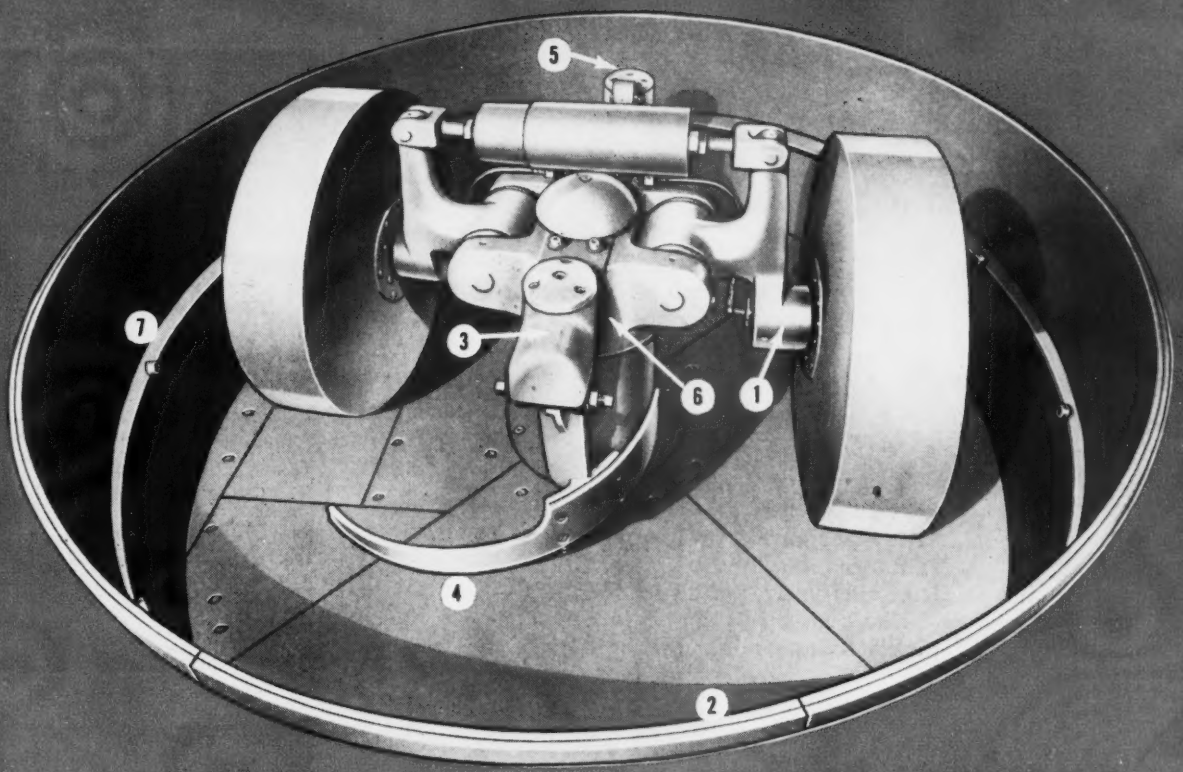
CLEVELAND, OHIO

HIGH CYCLE

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

FAST...SIMPLE MAINTENANCE

...years of trouble-free service assured with the Big Capacity 2F and 3F SIMPSON *Intensive* Mix-Mullers



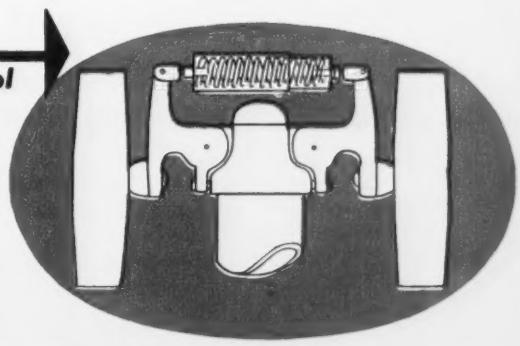
. . . Check these *7 Easy-Maintenance* features:

1. Mullers mounted on hubs containing bearing assembly. (Complete hub replaceable without removing muller from mixer.)
2. Muller crib has removable section through which all rotating machinery can be removed without interfering with overhead hoppers, structures, etc.
3. Inside and outside plows adjustable vertically and radially by positive screw device on upper end of plow brackets . . . without entering mixer.
4. No tapped holes . . . wearplate bolted to bedplate by through bolts . . . easily tightened or removed from underside by one man.
5. Mullers, center shaft, and rocker arm bearings are lubricated by centralized system from Alemite fittings accessible from outside mixer.
6. Speed reducers, turret, mullers and rocker arm assemblies each may be removed as self-contained units, without exposing bearings.
7. Crib liner clamped to crib — no bolts through liner.

For complete details on Simpson 2F and 3F Intensive Mix-Mullers, write for BULLETIN 511

SPRING-LOADED Mullers

The Secret of Better Sand Control



• The comparatively lighter mullers with adjustable spring pressure, as used in the 2F and 3F Mix-Mullers, greatly increase the efficiency of the mulling action, as the pressure can be adapted to the type of sand to be conditioned.

Because of the plow design and the muller suspension, the sand is subjected to much more violent agitation, and is considerably increased in volume. The agglomerate grains are broken up, and a fluffy sand of high flowability results.

SIMPSON *Intensive* MIX-MULLERS

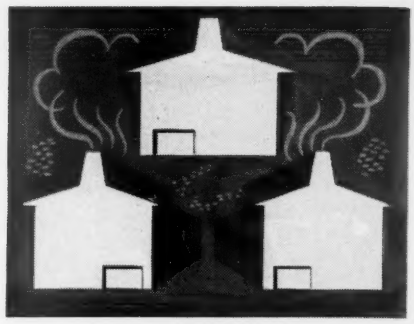
National Engineering Company

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries — George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney. for Argentina, Brazil and Uruguay — Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO ,S. De R.L., Mexico, D.F.

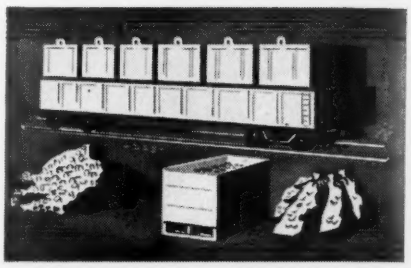
easier to get —

Three plants strategically located with greatly expanded briquetting facilities insure an ample supply.



easier to handle—

They're compact and strong. Take a minimum of storage space. Shipped to suit your handling facilities — bulk, bag, box type pallet, by container car, gondola or box car.



easier to work with —

There's no more tedious or uncertain weighing, no more guess work. Simply count out the number you need and toss them in.

OHIO FERRO-ALLOY

FOUNDRY ENGINEERED

BRIQUETS

OHIO FERRO-ALLOYS PRODUCTS

FERRO-SILICON 50 - 65 - 75 - 85 %
SPECIAL BLOCKING 50% FERRO-SILICON
LOW CARBON FERRO-CHROME SILICON
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BRIQUETS

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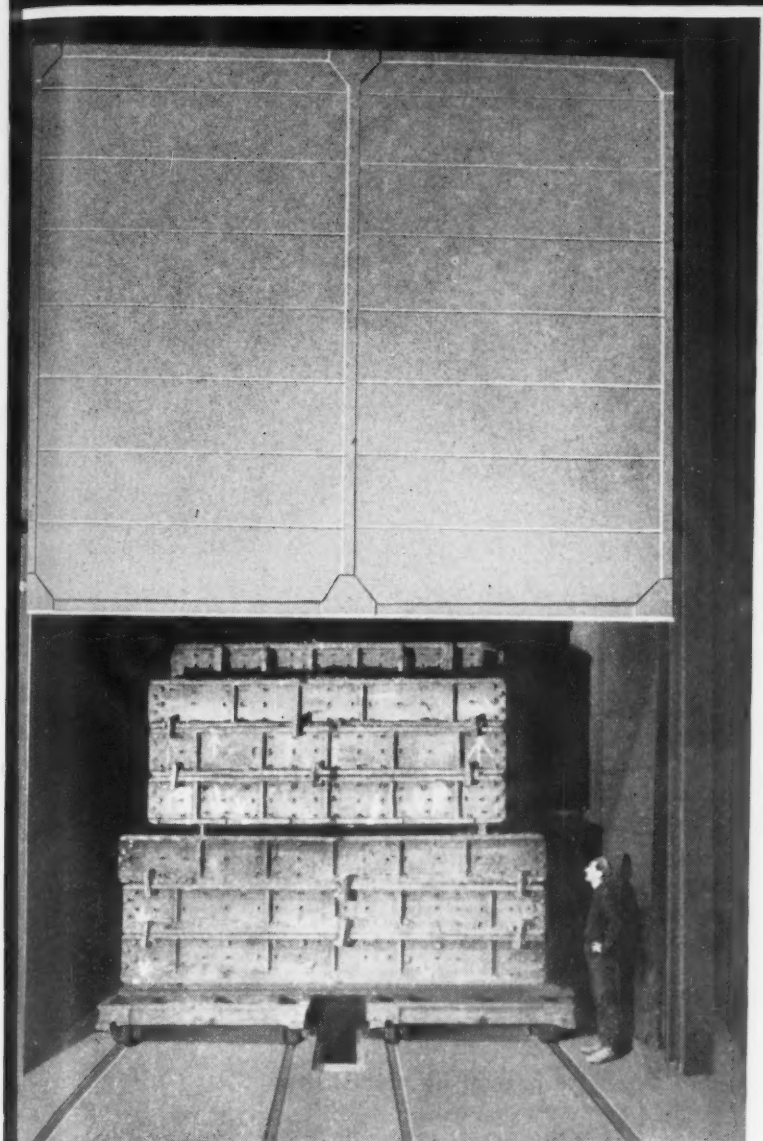
CARL-MAYER MOLD OVENS

Unusual in Size, too!



ARL-MAYER MOLD OVEN *at Blaw-Knox Div. of Union Steel Castings Co.*

DOOR CLEARANCE:
17'-9" wide, 15' high.
DEPTH: 40'

CAPACITY: 200 TONS PER BAKE.

Combination Gas-Oil Fired.

Carl-Mayer engineering advantages score again. This huge oven was chosen against several competitive makes—and its performance has won high praise from the owner.

If you are interested in ovens of this type, it will pay you to consider Carl-Mayer engineering and rugged construction.

CORE AND MOLD OVENS, all sizes. Also other types of Industrial Ovens and Furnaces.

Write for Bulletins 141 and 350

CARL-MAYER CORE AND MOLD OVENS ARE SERVING CONCERNS LIKE THESE:

Aluminum Co. of America
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Whiten Machine Works
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THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE

The finest costs no more

IMMEDIATE DELIVERY...ORDERS SHIPPED SAME DAY RECEIVED

ANY PRACTICAL SIZE. Freeman Dowmetal pattern plates are available in thicknesses of 5/16", ⅜", ½", ⅝", ¾", or 1" and can be furnished in standard sizes or shaped to your specifications.

UNIFORM THICKNESS. Their smooth, clean, velvety surfaces have a close parallel tolerance of .0025.

LIGHTER AND STRONGER. Plates have ample strength; are one third lighter than aluminum.

MACHINABILITY. Drills, taps and machines best of all metals used for pattern plates.

WRITE FOR descriptive literature and prices.

HAVE YOU received your copy of Freeman General Catalog?

THE FREEMAN SUPPLY CO.

Pattern Shop and Foundry Supplies and Equipment
Mahogany and Pine Pattern Lumber
1152 E. BROADWAY TOLEDO 5, OHIO

NEW DoALL FRICTION SAW BANDS

Now Available!

DoALL *Friction Saw*
Actual Size 1" Wide 10 Pitch

for all High Speed Band sawing machines 3,000 to 15,000 blade feet per minute

A Better, Longer-life Blade
Actual Size ½" Wide 14 Pitch

Special heat treating process locks the teeth against ripping out
Actual Size ¾" Wide 10 Pitch

us at the ASTE Show, Chicago, March 17

A Saw Band for Every Job
AVAILABLE FROM STOCK

DoALL makes the world's most complete line of saw bands for cutting every material. All are packaged in the exclusive DoALL "strip-out" container for safety, convenience and blade protection. These bands are AVAILABLE FROM LOCAL DoALL STORES. Call DoALL today.

SB-1

The Fastest, Cheapest way to cut Ferrous Metal Shapes

HIGH speed friction sawing generates enough heat to soften the metal ahead of the blade — makes possible shape cutting and cut-off work not practical with any other machining method. It cuts many times faster than conventional methods. Use it for cutting thicknesses up to 1". Cut cast irons and carbon, manganese, nickel, chromium, molybdenum, stainless steels and others. Cut a shape from armor plate or cut the gate or riser off a casting.

New DoALL friction saw bands have the teeth locked in by a special heat treating process so that you get longer blade life and lower costs. They are available in ½", ¾" and 1" widths; 10 or 14 pitch; 500 ft. lengths or cut lengths welded to fit your machine. For the ultimate in friction sawing use DoALL saw bands on the DoALL Zephyr Band Machine. Ask for a *free demonstration* at your plant.

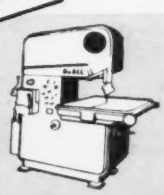
THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

ASK FOR DoALL BAND TOOL MANUAL

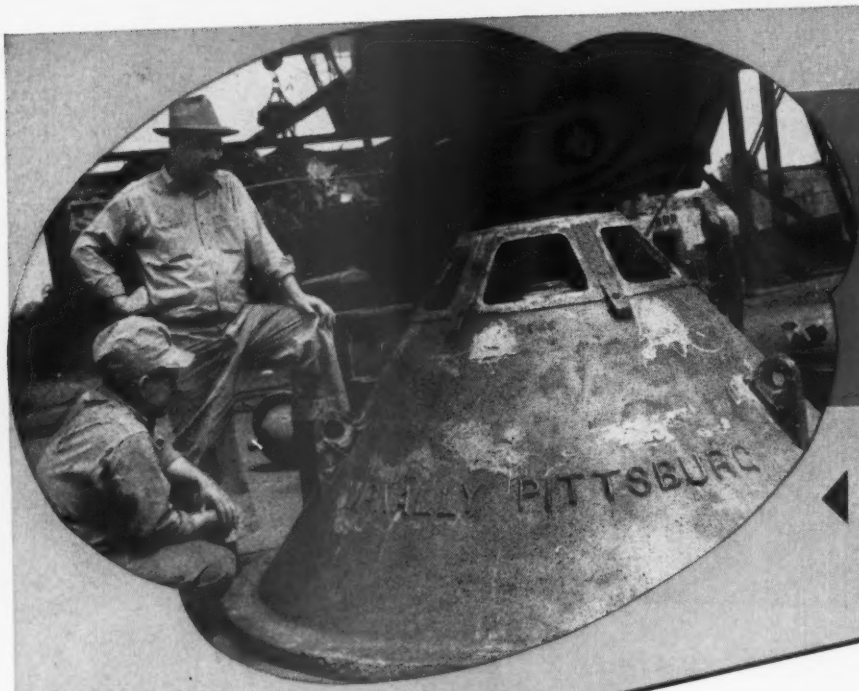
DoALL

SALES-SERVICE STORES IN PRINCIPAL CITIES

CALL DoALL FOR:



Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies



Fast, Safe S

TRAMRAIL a M

A heavy centrifugal dryer casting being in spected by General Superintendent H. T. Hend ricks and Heavy Floor Foreman L. L. Boone. This piece weighs 3620 lbs. Castings weighing from two oz. to 5300 lbs. are produced at McNally Pittsburgh.

McNally Pittsburg Foundries, Inc.

FOUNDERS OF PROCESS & ALLOY CAST IRON

Pittsburg, Kansas

Engineering Division
THE CLEVELAND CRANE & ENGINEERING CO.
Wickliffe
Ohio

Gentlemen:

We have your query about our present Cleveland Tramrail system. As you know, Tramrail was selected to service our three machine molding floors and the core department when this Foundry was built in 1945. Electric hoists are used.

The requirements were unusual. The machine floors handle a wide variety of work, calling for two to three types of metal during the day. Furthermore, the metal is scheduled on a semi-continuous basis, split into two separate heats. In addition, heavy flasks must be delivered to pouring conveyors and poured flasks must be delivered to the shakeout while the pouring cycle is proceeding.

This requires maximum flexibility in serving the floors with flasks, cores and metal; which was the determining factor in selecting Tramrail.

In our opinion, the experience over the past years has amply proven the success of your original recommendations. We feel that Tramrail is the most efficient and economical system for handling such a diversity of service demands.

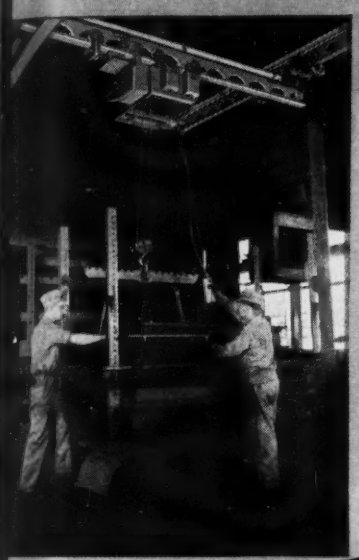
Cordially,

H. T. Hendricks
Superintendent

HTHendricks
trc

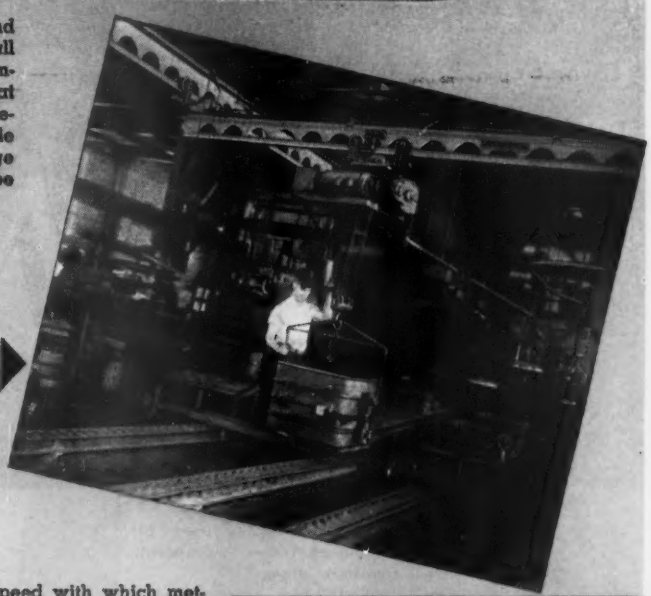
GENERAL OFFICES & FOUNDRY, PITTSBURG, KANSAS SUBSIDIARY OF THE MCNALLY PITTSBURG MFG. CORP. PITTSBURG, KANSAS
SALES OFFICES: CHICAGO, ILLINOIS PITTSBURGH, PENNSYLVANIA WELLSTON, OHIO
ALL CONTRACTS AND SHIPMENTS ARE SUBJECT TO STRIKES, FIRES, ACCIDENTS AND OTHER CAUSES BEYOND OUR CONTROL

Service PROVIDED BY CLEVELAND at McNALLY PITTSBURG FOUNDRIES



The core room foreman and one core man can handle all cores with a Cleveland Tramrail bridge and hoist that travels the length of the core-making floor. Considerable time would be lost if the large volume of cores had to be hand-lifted.

Flasks are easily closed by use of the Tramrail equipment and moved to correct pouring conveyor with minimum lost motion.



The speed with which metal can be handled demonstrates the efficiency of Cleveland Tramrail equipment and the time that can be saved through its use. Ladles leave the cupola in order poured and go directly to pouring stations on three floors without waiting for other ladles.

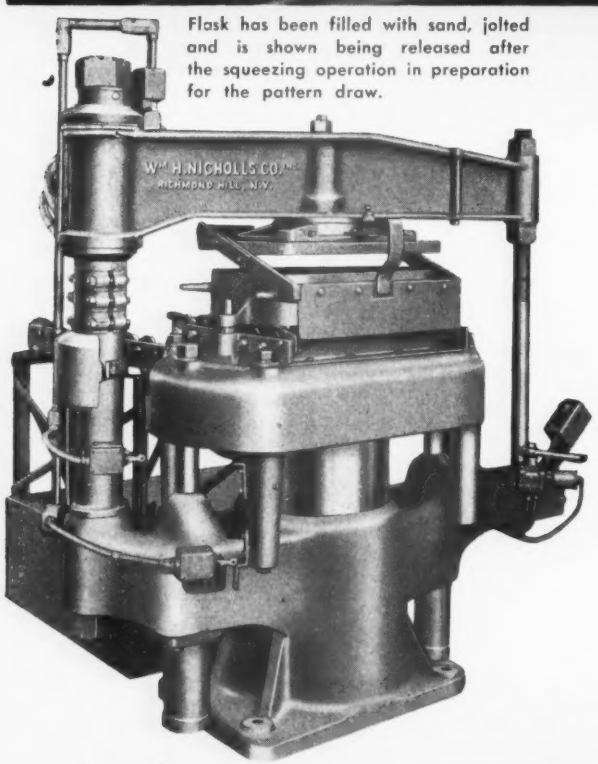
Pouring the medium floor with an average of 11,000 lbs. per day, the Cleveland Tramrail equipment has proven fast, flexible and safe. This bridge is reserved for this ladle. An average of 139 molds are poured per day.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3826 E. 286TH ST., • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



Flask has been filled with sand, jolted and is shown being released after the squeezing operation in preparation for the pattern draw.

HEAVY DUTY MOLDING Machines . . . Jolt Squeeze and PATTERN DRAW . . . Equipment with Single Push Button . . . for fully automatic Operation

HEAVY DUTY Combination Jolt and Power Squeezer Molding Machines with pneumatic pattern draw and power operated self positioning parallel squeeze head, equipped with electrical controls for single push button automatic operation of jolt, squeeze, pattern draw and cross arm, including automatic sand strike-off, mold pusher and adjustable flask roll-off device.

Wm. H. NICHOLLS Co., Inc.

RICHMOND HILL 18, LONG ISLAND, NEW YORK

Established 1910

NICHOLLS

WHY BESLY-TITAN "Job-Fitted" WHEELS are the Key to Greater Grinding Efficiency

Here's the master key to top efficiency in grinding operations: *Besly-Titan is set up to supply the right wheel for each job,* as you need it, when you want it, at no higher cost than stock wheels!

As the tumblers in a lock yield to just one key, only one set of specifications in the grinding wheel will get *best* results on a casting, with its own set of unique qualities. It is the differences in iron or alloy, the size and shape of casting, quantity of stock removed, type of grinder, results wanted from grinding, etc., that prevent one "key" from fitting job after job. Changed specifications in the work call for changed specifications in the wheel used.

This is why the "job-fitting" service you get with Besly-Titan Abrasive Wheels and Discs makes them the outstanding buy for foundries.

Besly-Titan is organized to diagnose your needs, prescribe the wheel that will perform best on a given job, and supply you on a few-days-delivery schedule. Use the coupon below, or write, to secure all details on formula recommendations and Trial Order Plan.

BESLY-WELLES
CORPORATION
(Established as Charles H. Besly & Co. in 1875)
20 No. Wacker Drive • Chicago 6, Illinois

BESLY-TITAN

BESLY-WELLES CORP., 20 No. Wacker Dr., Chicago 6, Ill.
(Established as Charles H. Besly & Co. in 1875)

☐ Please send details of Besly-Titan "Job-Fitted" Wheel Service.
☐ Also tell about Trial Order Plan.

*Name*_____

*Foundry*_____

*Address*_____

*City*_____ *Zone*___ *State*_____

Fine Craftsmanship

MAKES JEWELRY COST MORE . .

. . . makes BUFFALO PATTERNS COST LESS

FOR INSTANCE This large mahogany Core Box, part of a large combination wood and metal experimental pattern equipment for limited production of magnesium castings, was completely machined on this universal wood worker. This Core Box will be steel-faced on wear points and will be accompanied by all-machined, heat-treated Aluminum Core Dryers.

Whether your casting specifications require a Wood or an all Metal Production Pattern Equipment, with gauges, fixtures and hundreds of core dryers, the quality, precision and low-maintenance cost of that equipment plus the ultimate economy of your foundry operations, are always guaranteed by Buffalo's complete machine facilities coordinated by our experienced engineering staff.

Unlike a piece of fine jewelry . . . the more skill, patience and fine craftsmanship that we put into producing a pattern for you THE LESS IT COSTS YOU!

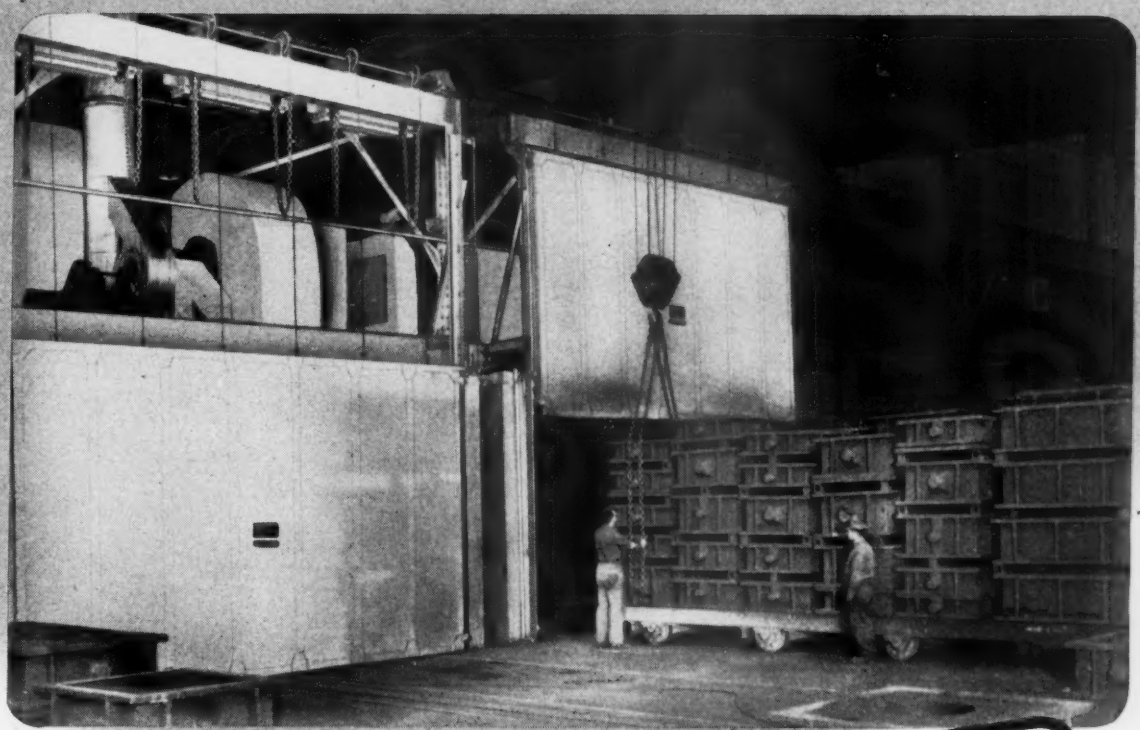
No, this does not mean that our highly skilled pattern makers work for less or that we sell our patterns for less. In fact, you probably will pay a little *more* for a Buffalo Pattern than you would for ordinary equipment. BUT. . . you'll find a BIG difference in the pattern itself. For over half a century and down through three generations, our craftsmen have preserved NOT ONLY the patience and precision that is so essential to fine pattern making, but ALSO that old-fashioned ingredient of "pride in a job well done".

That's why our engineering staff can tackle your toughest jobs, no matter what size they may be, plan them thoroughly and turn them over to our shop for production with the certainty that the finished equipment will fit your foundry and your production schedules like the mechanism in a fine watch. You'll have no adapting or *extra* rigging to do, and your scrap ratio will be held to a minimum. That's the way Buffalo Patterns save you money . . . not by skimping on equipment to make the "quote" look good!

BUFFALO PATTERN WORKS, INC. · **830 HERTEL AVE., BUFFALO 16, N. Y.**

DESIGNERS AND MANUFACTURERS OF PATTERN EQUIPMENT FOR OVER HALF A CENTURY

for perfect mold drying
COLEMAN OVENS



Coleman Car Type Mold Ovens in foundry of large engine manufacturer

● Coleman Car Type Mold Ovens dry molds with the speed and uniformity required for increased production of quality, true-to-pattern castings in dry sand. Perfect drying eliminates mold and casting scrappage, saves valuable materials, time, and manpower.

Coleman Car Type Core Ovens, for large, heavy core work, are the acknowledged leaders in dependable, economical performance... used by leading foundries in every class of heavy castings production.

Coleman Oven Cars are equipped with specially designed roller bearings to carry maximum loads under the severe conditions of foundry oven service. Motorized car haulage equipment can be furnished. Write for Bulletin 48

Only COLEMAN OVENS offer all these advantages:

- PERFECT DRYING AND BAKING eliminate manpower and casting losses due to make-overs and rejects.
- INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.
- HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost.
- GREATEST SAVINGS IN FUEL by using the most economical fuel available.
- MOST ECONOMICAL CORE BINDERS for your particular casting requirements, oil or resin, can be used.

A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD CLEVELAND 13, OHIO

FEMA

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

ABILITY

Protected by their peculiar shell armor and possessing an extraordinary immunity to disease, Giant Turtles often live to extremely old age. Without question, they are the most durable of all creatures.

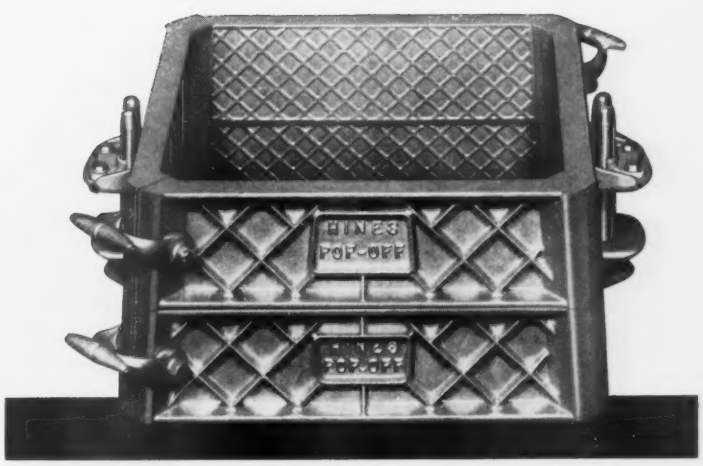
HINES FLASKS, too, can lay claim to records in durability. For over thirty years, HINES has been making foundry flasks and jackets exclusively — building better flasks, for longer service. HINES FLASKS are fixture-built to extreme accuracy, reinforced at the parting line and strengthened with diagonal ribs. Furthermore, their exclusive "Pop-Off" feature permits easy removal from the mold, *without hammering.*

You can depend on HINES FLASKS to give better service and longer life than any flask you've ever used. So, next time you're in need of flasks, or jackets, get in touch with HINES.

HINES FLASKS

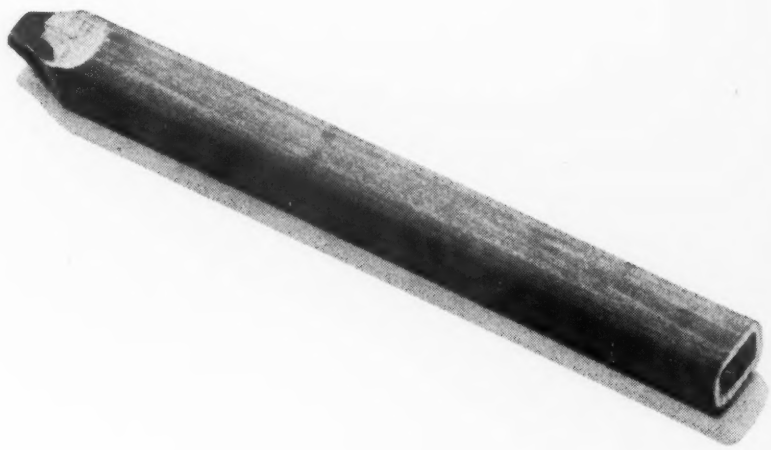
HINES POP-OFF FLASK

The matter of age in turtles is one that has excited considerable public interest and, unfortunately, one that has led to many exaggerations. Reports of turtles living 500 or more years are untrue. Nevertheless, turtles do enjoy extremely long life. The record is held by an "Old World" tortoise—scientifically verified to have lived 177 years. A pretty durable old fellow, when you figure he was born prior to the signing of our Declaration of Independence.



The Hines Flask Co., 3431 West 140th Street, Cleveland 11, Ohio • Telephone: ORchard 1-2806

Bill — you can get smoother cores with Mogul!



LARGEST SELLER IN THE FIELD!

Kordek, the preferred dry bond for cores . . .

• CUTS DRYING TIME • CUTS DOWN DISCARDS

Full technical service, without obligation, is available to show how you can profit from the use of MOGUL® Cereal Binder in your production.

Write Technical Sales Department

CORN PRODUCTS REFINING COMPANY • 17 BATTERY PLACE, N. Y. 4, N. Y.

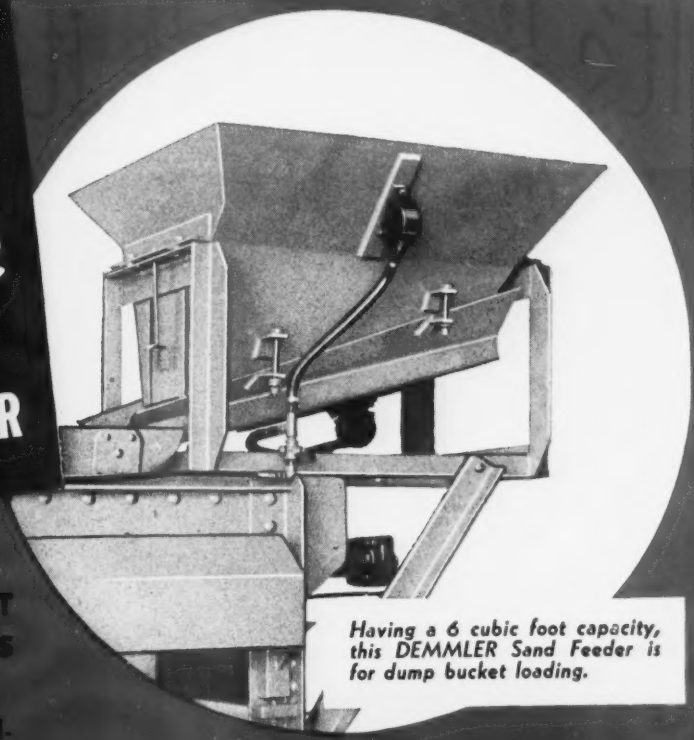
ELIMINATE "POKING OF SAND"

Increase Core Blower Production With NEW

DEMMLER

NON-CLOGGING

VIBRATORY SAND FEEDER



Having a 6 cubic foot capacity, this DEMMLER Sand Feeder is for dump bucket loading.

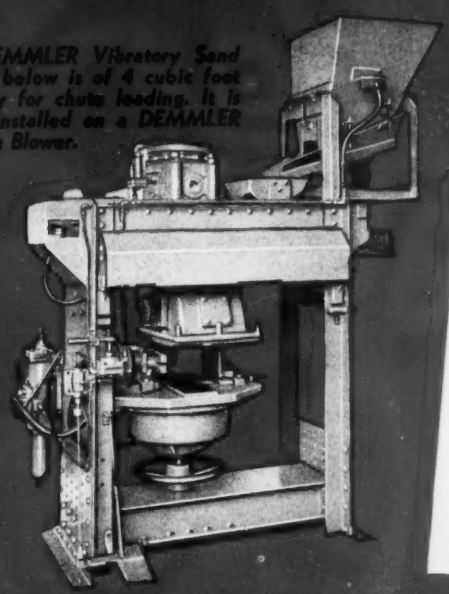
FOR CHUTE OR DUMP BUCKET LOADING OF CORE BLOWERS

Here's another dependable DEMMLER development that means increased core production at lower cost!

It's the new DEMMLER Non-clogging Vibratory Sand Feeder that makes it unnecessary for machine operators to take "time out" to load sand.

Under development and exhaustive tests for 2 years, the DEMMLER Vibratory Sand Feeder is powered by two comparatively noiseless rotary type vibrators in which an air stream forces a 1-3/8" steel ball around a hardened steel track.

The DEMMLER Vibratory Sand Feeder below is of 4 cubic foot capacity for chute loading. It is shown installed on a DEMMLER 3K Core Blower.



SAND FLOWS "LIKE WATER"

Sand is stored in the hopper above a sloping chute. When the core machine carriage is in filling position, the feeder starts automatically, walking the sand down the chute into the sand magazine. Because of its vibrating action, sand is delivered into the core blower in an ideal condition for blowing. No poking by operator is ever required because sand flows like running water — even when it is so stiff you can pack it into "snow-balls"! Sand flow stops automatically when core machine carriage is in blowing position.

Sand feeder cannot overfeed. When hopper is full, sand delivery stops.

EASY TO MAINTAIN — WILL LAST INDEFINITELY

The DEMMLER Vibratory Sand Feeder requires absolutely no attention once set into operation with cycle of machine. Maintenance of sand feeder is negligible since there are extremely few moving parts. This means long, long life!

Available for any DEMMLER Core Blower, from the small No. 55 to the large No. 4E, the non-clogging sand feeder is shipped complete with all valves and equipment necessary for mounting. It is available in 4 cu. ft. capacity for chute loading and in 6 cu. ft. capacity for dump bucket loading.

Should a larger sand storage capacity be required, the customer can easily extend the sides of the storage hopper furnished on the feeder.

Write — today — for complete details!

Wm. DEMMLER & BROS.

KEWANEE, ILLINOIS

Speed plus dependability ★ *Manufacturers of Core Blowers Exclusively Since 1911*

It's light ...it's flexible

NEW NORTON BFR FLEXIBLE *REINFORCED* HUB WHEEL gives you all the portable grinding advantages that come from *light weight, contour-hugging* flexibility, *extra* safety and *long* life. The extra safety comes from *extra fabric reinforcement.* Teamed up with the ever-popular Norton BD rigid hub wheel, it multiplies the number of jobs you can profitably do with your portable grinders and sanders. Like the BD wheel, the new Norton BFR wheel comes in 7" and 9" diameters in ⅛", 3/16", and ¼" thicknesses. Specify A24-K BFR for the average job.

...and it's extra safe

NEW NORTON BFR FLEXIBLE REINFORCED HUB WHEEL

Adds new speed, ease and safety to your portable grinding jobs

Now . . . you can do more jobs better with your standard portable grinders and sanders than ever before. This new Norton BFR *flexible* wheel teams up perfectly with the popular Norton BD *semi-rigid* wheel to give you the most versatile pair of wheels in your shop. The chart at the right gives you a quick picture of some of the jobs you can do with these two Norton *Reinforced Resinoid* Hub Wheels.

This new Norton BFR flexible *Reinforced* Hub Wheel is sure to make a big hit with you and your men because:

It's a fast-cutting wheel . . . thanks to its sharp, durable ALUNDUM* abrasive and special resinoid bond.

It's a time-saving wheel for blending in contours and corners because it has the necessary flexibility for this type of work.

It's a safe, strong wheel because it has *extra* fabric reinforcement molded into it. It holds together even if it should be accidentally cracked.

For average light weld grinding and miscellaneous smoothing, this disc type wheel will do the whole job. For more severe work, select its teammate, the Norton BD *Reinforced* Hub Wheel, or, for a *real* heavy job, a Norton cup shape grinding wheel.

Your nearby Norton distributor will be glad to demonstrate this new Norton wheel to you. He's listed under "Grinding Wheels" in your classified telephone directory. Or write direct to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. EXPORT: Norton Behr-Manning Overseas Inc., Worcester, Mass., New Rochelle, N. Y.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

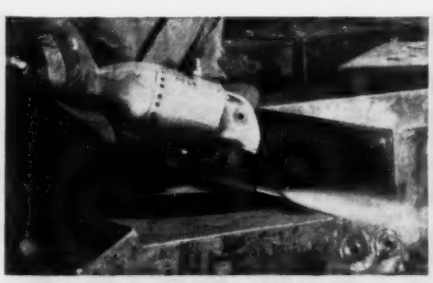
Just a few of the jobs you can do with Norton BD and BFR wheels

Where both types of wheels are indicated choice is dependent on the nature of the job.

THE JOB	BD Semi-Rigid	BFR Flexible
Removing rust and scale, scarfing and beveling before welding	X	X
Cutting away, smoothing and blending welds on fabricated work	X	X
Making V cut to remove old weld materials for salvaging steel parts	X	
Removing burrs and sharp edges from steel sheets and plates	X	X
Roughing off excess weld material before smoothing with coated abrasive discs	X	X
Cutting off gates and risers on brass, bronze and aluminum castings		X
Notching large gates and risers on all kinds of castings		X
Cleaning between teeth of large marine and industrial gears	X	
Removing mold marks and smoothing castings before painting		X
Smoothing flame-cut edges on heavy steel sheets and plates	X	

NORTON ABRASIVES

Making better products to make other products better



SMOOTHING DOWN WELDS in hard-to-get-at places is quick, easy and safe with your choice of the new Norton BFR flexible *Reinforced* Hub Wheel or its BD teammate.

BLENDING WELDS ON CONTOURS is another job you can do better and faster with the new Norton BFR flexible *Reinforced* Hub Wheel. It keeps close contact with the work.

NOTCHING RISERS in all kinds of castings prior to breaking them off comes easy to the new Norton BFR *Reinforced* Hub Wheel. You'll like the *extra* safety factor, too.

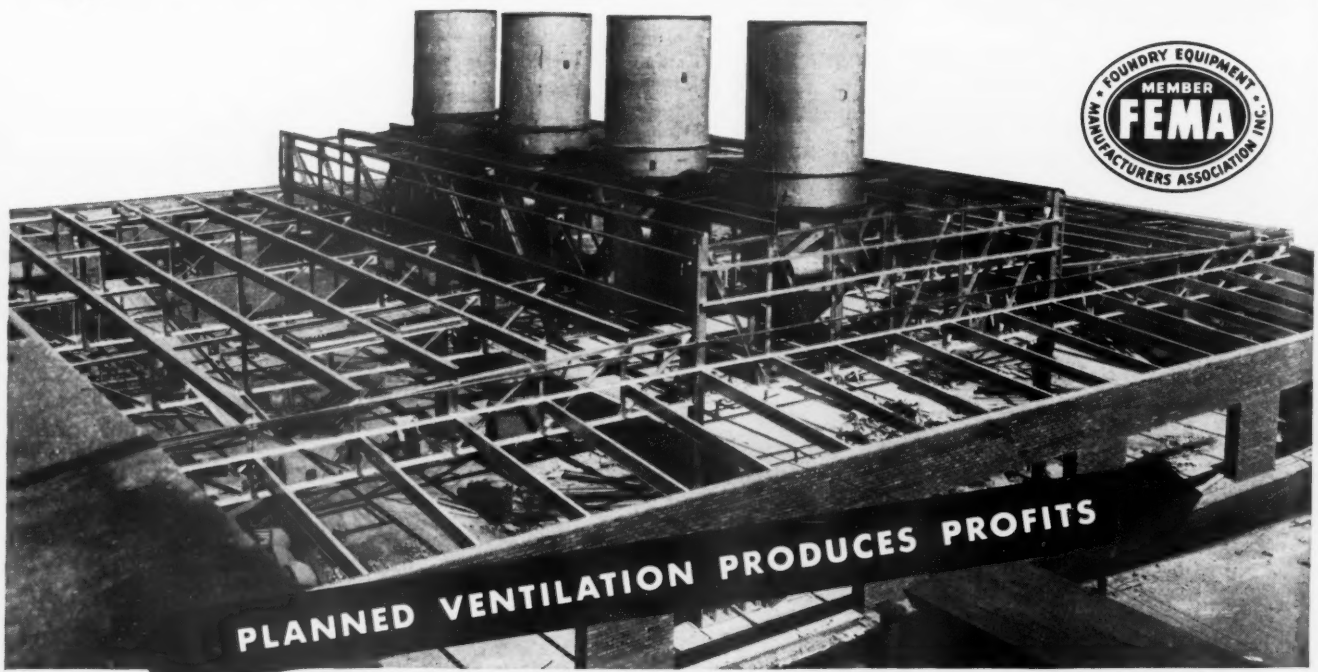
ELIMINATE *Extra* EXPENSE

include in the plans a

MULTI-WASH

System

for that new foundry or addition



Plans for that New Foundry or proposed addition should include a Schneible Multi-Wash Dust Collecting System. Important savings may be realized if Multi-Wash Collectors are installed while a foundry is being erected because (1) they may be placed in position without the need of special rigging, (2) where units are installed through or on the roof there is no need for cutting existing framework, special fitting or flashing and (3) where a large system is involved (as illustrated above) it is less expensive to move the sections to the site and erect them without interference from walls, equipment or workers.

Clean, dust-free air is a must in modern planning. Get the benefits to be derived from a Multi-Wash system, it will more than pay the expense. Multi-Wash is the ultimate of simplicity in dust control. The air is washed continuously . . . dust and fumes are removed and converted into innocuous sludge. The sludge is dewatered periodically in a settling tank for removal from the premises in a damp, dustless state; the clear water is recirculated through the system.

Multi-Wash is quiet, efficient and trouble-free . . . making it inexpensive to operate. For further information or assistance in your foundry planning, call the local Schneible engineer or write direct.

Your inquiry will receive expert attention.

CLAUDE B. SCHNEIBLE COMPANY • **P. O. Box 502, Roosevelt Annex, Detroit 32, Mich.**

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

SCHNEIBLE

MANUFACTURERS • ENGINEERS • CONTRACTORS

Late Foundry News

JANUARY 28, 1952

STEEL FOUNDERS ELECT: H. A. Forsberg, vice president, Continental Foundry & Machine Co., East Chicago, Ind., has been elected president of the Steel Founders' Society of America. New vice president is Carl F. Barchfeld, sales manager, Commercial Steel Casting Co., Marion, O. New directors are: Arthur S. Breithaupt, vice president and sales manager, Dodge Steel Co., Philadelphia; J. M. Kincaid Jr., president, Kincaid-Osburn Electric Steel Co., San Antonio, Tex.; William P. McGervey Jr., president, Hanford Foundry Co., San Bernardino, Calif. Messrs. Forsberg, Barchfeld and Breithaupt comprise the executive committee.

MORE CAPACITY: Latest DPA certificates of necessity approved (to Dec. 21) for accelerated tax amortization of new or expanded foundry facilities include: Superior Bearing Bronze Inc., Brooklyn, N. Y., $268,285; Elyria Foundry Division of Industrial Brownhoist Corp., Elyria, O., $427,900; Manitowoc Grey Iron Foundry Inc., Manitowoc, Wis., $69,840; American Radiator & Standard Sanitary Corp., Litchfield, Ill., $549,750; Aluminum Co. of America, Buffalo, $65,000; General Motors Corp., $573,400 at Saginaw, Mich., $6,155,000 at Danville, Ill.; Detroit Magnesium & Aluminum Casting Co., $26,525; Union Metal Mfg. Co., Canton, O., $24,384; Sawbrook Steel Castings Co., $29,444; Crane Co., Chicago, $186,500; Emhart Mfg. Co., Stonington, Conn., $293,700. Exclusive of this list total certificates approved for foundries as of Nov. 30 represented a proposed total investment of about $57 million at 102 plants. This was an increase of $5½ million compared with the Oct. 19 total reported here last month. DPA has approved only about one-third the applications received from all industries. Railroads have been the leading recipients of approved certificates.

SMALL PLANT LOANS: Small Defense Plants Administration has a pamphlet explaining how small business can get government loans for defense and essential civilian purposes. Copies are available from the SDPA, 1337 E St., Washington, and from Reconstruction Finance Corp. field offices, where applications for such loans must be filed.

CENTRIFUGAL FOUNDRY SOLD: Perfect Circle Corp., Hagerstown, Ind., has contracted for the purchase on or before Mar. 31 of all stock of Centrifugal Foundry Co., Muskegon, Mich. Both companies produce centrifugal castings for the manufacture of cylinder liners.

LIGHT METALS: Although foundry capacity appears adequate for producing medium-size aluminum castings, a shortage is reported in facilities able to handle larger sizes—100 to 4000 pounds. Some difficulty also is said to exist in procurement of aluminum precision investment castings for defense purposes. Magnesium casting capacity is being expanded but NPA is seeking additional foundries interested in turning to this type of work.

PRIMARY ALUMINUM: When the planned expansion in primary aluminum producing capacity is completed in 1953 the industry's potential annual output will total 1½ million tons, or double that at the end of 1950. About 150,000 tons of new capacity has gone into operation; 400,000 more tons is scheduled to go in this year and the remaining 200,000 tons in 1953. Meanwhile the supply of both primary and secondary aluminum ingot continues tight, but an amendment to NPA Order M-5 specifies that holders of CMP aluminum allotments will, upon application to the Aluminum and Magnesium Division, be guaranteed positions on a producer's schedule.

BRASS AND BRONZE: Programs approved by DPA will require in the second quarter about 331 million pounds of brass and bronze castings, a figure which includes a 10 per cent attrition factor. In the like 1951 period the industry shipped more than 305 million pounds. NPA admits that while the slight acceleration in flow of scrap recently has not placed supplies in a satisfactory position, every effort will be made to supply foundries with sufficient raw materials to meet projected goals. Plans are being made to allocate additional composition scrap for the production of alloy ingot.

RELATIVE SCARCITY: Latest "List of Basic Materials and Alternates" issued by DPA ranks ferrous castings and raw materials this way: Group I (metals in short supply)—low-phosphorus pig iron, and steel and heavy gray iron castings; Group II (in approximate balance)—other grades of pig iron; Group III (in fair to good supply)—light alloy gray iron, light and intermediate weight plain gray iron, and malleable iron. Aluminum, copper, lead, tin, zinc and magnesium are among nonferrous metals in Group I.

PERSONALS: J. S. Morrison, recently deputy chief, Castings and Forgings Section, OPS, Washington, has been appointed acting chief. E. J. Metzger, formerly chief of the section, has returned to industry (see page 124) . . . William J. MacNeill has been made vice president in charge of operations, Badger Malleable & Mfg. Co., Milwaukee. He has been foundry manager, Acme Aluminum Alloys Inc., Dayton, O. . . . Dr. Francis C. Frary, retired director of research, Aluminum Co. of America, has been named chairman of the new Minerals and Metals Advisory Board. The board, a reconstitution of the Metallurgical Advisory Board, will advise defense agencies on

mineral technology and metallurgy . . . John R Townsend, Bell Telephone Laboratories, has been appointed consultant on materials conservation to ODM Director Charles E. Wilson. He will work through the American Society for Testing Materials in promoting conservation of scarce materials and use of substitutes . . . D. Frank O'Connor has left the Foundry Branch of NPA's Copper Division to join the Mutual Security Agency as foundry consultant with headquarters in Rome, Italy.

NEW OFFICE: A new agency, known as the Office of Aluminum, has been established within the Defense Production Administration. Its head is S. W. Anderson, former program vice chairman of WPB during World War II. The office will deal with overall planning concerned with production and consumption of aluminum.

MORE COKE: One of the largest coke oven construction programs in history is in progress. Involving more than $190 million, it will provide 8,395,000 tons of coke annually. Much of this will replace old ovens being retired through obsolescence. About 44 per cent of existing ovens are over 25 years old.

DEOXIDIZING INGOT: Ceiling prices for steel deoxidizing grades of secondary aluminum ingot have been increased by OPS in a revision of CPR 54, effective Jan. 16. The advances on the four grades range from less than a cent to slightly under 2 cents.

MISCELLANY: Loss of the foundry pig iron that went down with the *Flying Enterprise* would have been more serious had it occurred several months ago when the domestic situation was more acute . . . Interlake Iron Corp.'s Erie, Pa., coke ovens are going back into production after being down about ten months for repairs . . . A four-man team from Austria's only producer of iron rolls for steel mills is making a month's tour of United States roll plants . . . Vulcan Iron Works Inc., Chicago, is celebrating its 100th anniversary . . . NPA says molybdenum supplies probably will start easing this summer if new production facilities are operating by then . . . Increases between last June 1 and Nov. 1 in number of registered apprentices in molding-coremaking and patternmaking were 7.5 and 6.5 per cent, respectively, the Department of Labor reports . . . Indicated demand for artificial graphite electrodes this year totals about 288 million pounds and supply is estimated at 282 million, according to NPA.

PRICES OF FOUNDRY METALS AND COKE

(As of Jan. 28, 1952)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	21.30
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis (delivered)	25.40
Swedeland, Pa.	22.60
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	57.50	58.00
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—27.25c; 88-10-2—38.50c; 80-10-10 — 32.25c; No. 1 yellow — 23.25c.

ALUMINUM: 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 19.50c. Deoxidizing grades: No. 1 18.80c; No. 4 18.20c.

MAGNESIUM: 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered.

ZINC: High grade 20.85c, delivered. Die casting alloy 23.65c-24.25c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Bundles	Cast Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$44.00	$39.00	$41.50	$39.00
Buffalo	43.00	48.00	43.00	45.50	43.00
Chicago	42.50	47.50	42.50	45.00	42.50
Cincinnati	43.00	48.00	43.00	45.50	43.00
Cleveland	43.00	48.00	43.00	45.50	43.00
Detroit	41.15	46.15	41.15	43.65	41.15
Eastern Pa.	42.50	47.50	42.50	45.00	42.50
Los Angeles	35.00	40.00	35.00	37.50	35.00
Pittsburgh	44.00	49.00	44.00	46.50	44.00
San Francisco	35.00	39.00	35.00	37.50	35.00
St. Louis	41.00	46.00	41.00	43.50	41.00
Seattle	35.00	40.00	35.00	37.50	35.00

Above delivered prices are ceiling levels at basing points indicated. *Applies to dealer and industrial scrap; No. 1 and No. 2 heavy melting steel are $1 less; No. 1 railroad heavy melting is $2 higher. **$2 higher if 1 ft or under. $3 higher when steel 2 ft or under is sold to a gray iron foundry but OPS permission required to pay premium price.

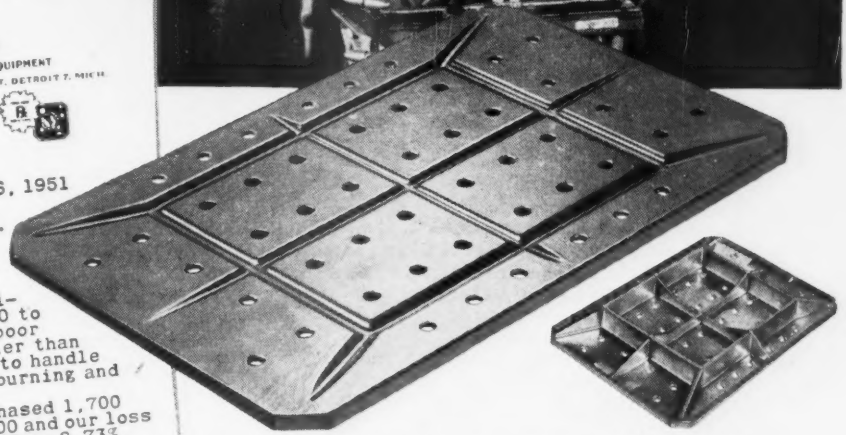
CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

"EDCO Dowmetal BOTTOM BOARDS have resulted in tremendous savings for our foundry"

... says M. C. Crawford of RILEY STOKER CORPORATION



RILEY STOKER CORPORATION
FUEL BURNING AND STEAM GENERATING EQUIPMENT
101 WALKER STREET, DETROIT 7, MICH.

Christiansen Corporation
1515 North Kilpatrick Ave.
Chicago 51, Illinois

May 16, 1951

Attn: Mr. Edw. S. Christiansen, Pres.

Gentlemen:

Before the purchase of EDCO Dowmetal Bottom Boards, we made our own wood boards at a cost of approximately 70c each. We would make 5,000 to 6,000 per year and ended up with a poor quality board. They were much heavier than EDCO magnesium boards, not as easy to handle on the line, and our losses due to burning and breakage were 60 to 80% per year.

In three years time, we have purchased 1,700 of your boards at a cost of $7,585.00 and our loss in this period has been only $207.36 or 2.73%.

EDCO Dowmetal Bottom Boards have resulted in tremendous savings for our foundry. It is a pleasure to recommend them to other foundries.

Yours very truly,
RILEY STOKER CORPORATION
M. C. Crawford
M. C. Crawford
Director of Purchases
Detroit Plant

Above photo shows molder at Riley Stoker Corporation placing EDCO Bottom Board on flask preparatory to pressing. EDCO DOWMETAL magnesium boards maintain high quality of castings and reduce rejects because the exclusive grooved and vented design permits escape of gasses and insures mold stability.

Riley Stoker Corporation is one of the three largest manufacturers of steam generating and fuel burning equipment in the country. EDCO DOWMETAL Bottom Boards are used exclusively in their foundry in the production of gray iron and alloyed casting components.

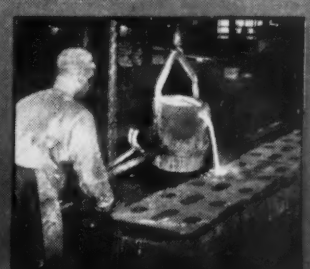


Photo at left shows molder pouring sand into flask. Photo at right shows molten metal being poured into molds which rest on EDCO Bottom Boards. Gravity conveyor line carries molds on for further processing.

Progressive foundry operators, like Riley Stoker Corporation, are equipping their foundries with EDCO DOWMETAL Bottom Boards.

Made of magnesium, these boards will not warp or break. There are no nails to come out, nothing to break or split—no upkeep! So durable, they can be considered permanent equipment. The many advantages from the use of these boards are effective immediately on their installation.

Write us or phone CApitol 7-2060 today for complete price schedule and list of 74 standard sizes available from stock.

EDCO CHRISTIANSEN CORPORATION

CHRISTIANSEN CORPORATION
1517 N. KILPATRICK AVE. • CHICAGO 51, ILLINOIS
ALUMINUM ALLOY INGOTS • ZINC BASE DIE CASTING ALLOYS

DELTA FOUNDRY PRODUCTS

SPEED PRODUCTION OF BETTER, CLEANER CASTINGS AT Lower Cost

CORE AND MOLD WASHES:

FOR STEEL:

Delta Special Core & Mold Wash Base — Used by more steel foundries than all other types of washes combined.

Delta SteelKoat — a finished high fusion waterproof wash.

FOR ALL TYPES OF SAND CAST METALS:

Delta ThermoKoat — It's plasti-lastic, non-heat shocking, highest fusion and hot strength.

Delta Z-Koat — a zirconium wash with unusual properties in contact with molten metal.

FOR GRAY IRON, MALLEABLE, BRONZE AND BRASS:

Delta GraKoat — no reaction with molten metal.

Delta BlacKoat — a black wash, free from carbon, no gas in contact with molten metal.

FOR GRAY IRON:

Delta BlacKoat S-5 — a new and different wash. Produces results, on gray iron castings, unequalled by any other wash.

FOR NON-FERROUS AND LIGHT METALS:

Delta NonferrusKoat — produces unusually smooth surface castings.

PARTING COMPOUNDS:

Delta Partex — (Nutshell partings) has lycopodium properties, non-injurious and non-hazardous to use.

Delta Liquid Parting — Low-cost, highly effective and lasting.

MUDDING & PATCHING COMPOUNDS:

Delta Sliktite — a light colored mud for all types of metal castings.

Delta Ebony — a black mud for gray iron, malleable and nonferrous work. All mudding compounds seal core joints and hold joints together at high temperatures.

NO-VEIN COMPOUND:

A special compound, not iron oxide. A high hot strength and sand plasticizing material. Stops veins and penetration.

MOLD SURFACE BINDERS—LIQUID:

Delta Spray Binders — Produce dry sand mold results by surface spraying of green sand molds.

PERMI-BOND:

Eliminates Sea Coal Nuisance: The new modern scientific sea coal replacement.

DRI-BOND:

A new type of Dry Binder which provides new economies. Fast-baking, reduces veining and penetration. Can be used with old sand equally as well as with new sand.

BONDITE: Produces a reducing mold atmosphere:

For Steel and Gray Iron — Use Delta Bondite, a dry binder which becomes waterproof on drying and produces mold atmosphere which is high in reducing gas.

96-B SAND RELEASE AGENT:

Another Foundry *"First"* by Delta. By adding 8 oz. or less per ton to your core or molding sand mixes, your sands will flow freely. 96-B is completely volatile at elevated temperatures and does not contaminate the sand.

CORE ROD DIP OIL NO. 224X:

Ties core rods and wires into the cores:

Rods and wires coated with Delta Core Rod Dip Oil adhere to the sand. Eliminates need for 50% of the rods and wires and reduces core breakage.

DELTA SAND CONDITIONING OIL:

Sticking core sand mixes work freely in core boxes when sand conditioning oil is added to core sand mixers.

CORE OILS:

High tensile, low gas, faster baking, exceptionally economical to use.

Get the Facts...

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

PERFECT SURFACE IS A "MUST". . .

Large drying rolls, like the one below receiving its final polishing pass, are used in "Yankee Dryer" paper-making machines which turn out soft facial tissue. Even slight surface flaws in these eight- and twelve-foot diameter castings cause them to be rejected.

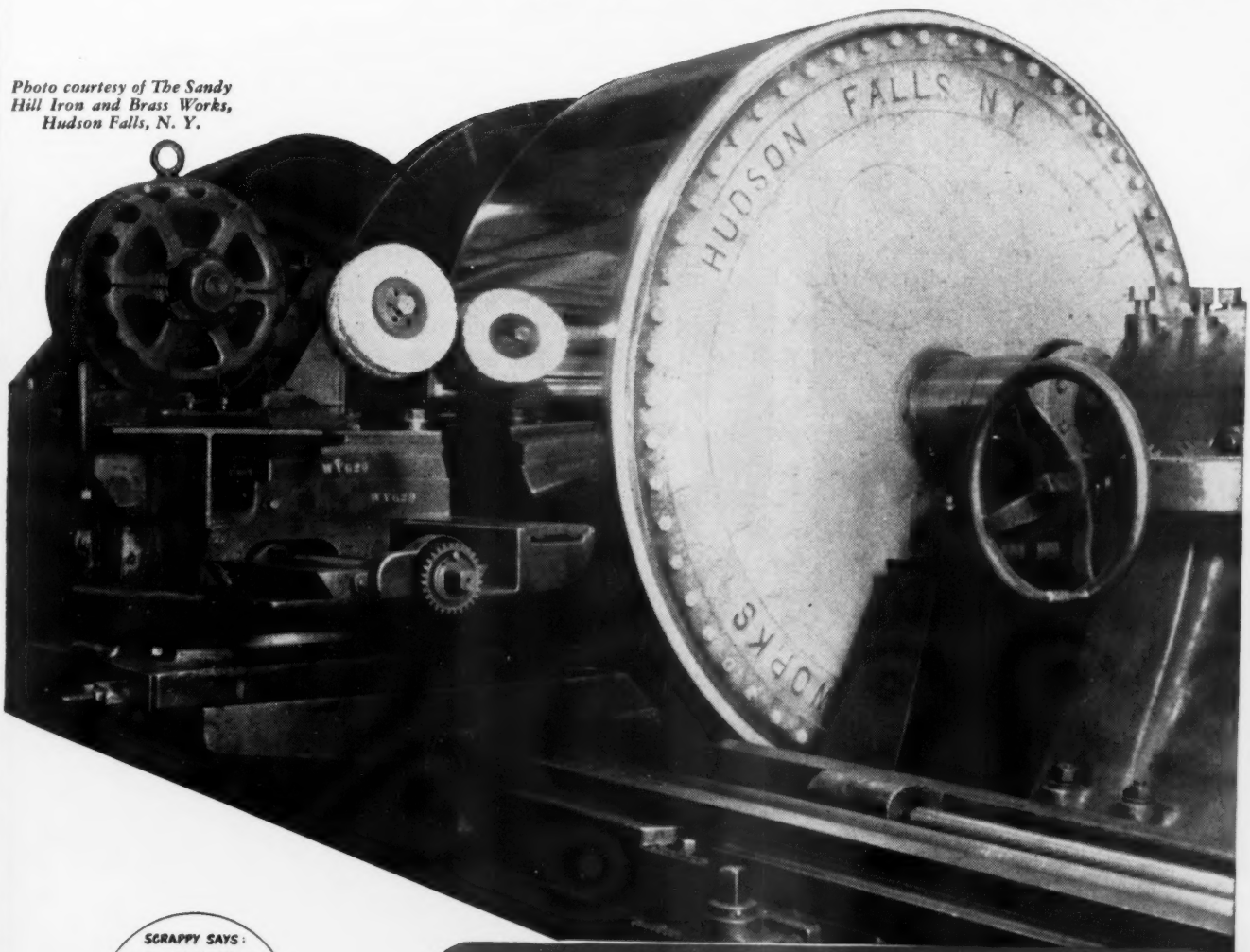
So they use CHATEAUGAY PIG IRON

. . . the low-phosphorus, copper-free pig iron that has eliminated scrap losses in countless "tough casting" jobs. With CHATEAUGAY, consistently uniform "physicals" assure predetermined fine grain structure throughout every casting, regardless of size or shape.

Whatever the requirements of your castings—if ordinary pig iron won't do the job—NOW is the time to investigate the *exclusive* advantages of premium CHATEAUGAY. A Republic Pig Iron Metallurgist will be glad to give you the complete facts at your convenience. Write today to:

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Photo courtesy of The Sandy Hill Iron and Brass Works, Hudson Falls, N. Y.



Republic PIG IRON

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

this ring/cement lining

goes in faster . . . stays in shape longer

Here's a lining for non-ferrous furnaces that can be installed in a couple of hours over a week-end, and be ready to go on Monday. It consists of one-piece CARBOFRAX silicon carbide rings, 1½" thick, backed up with 2½" of ALFRAX aluminum oxide cement.

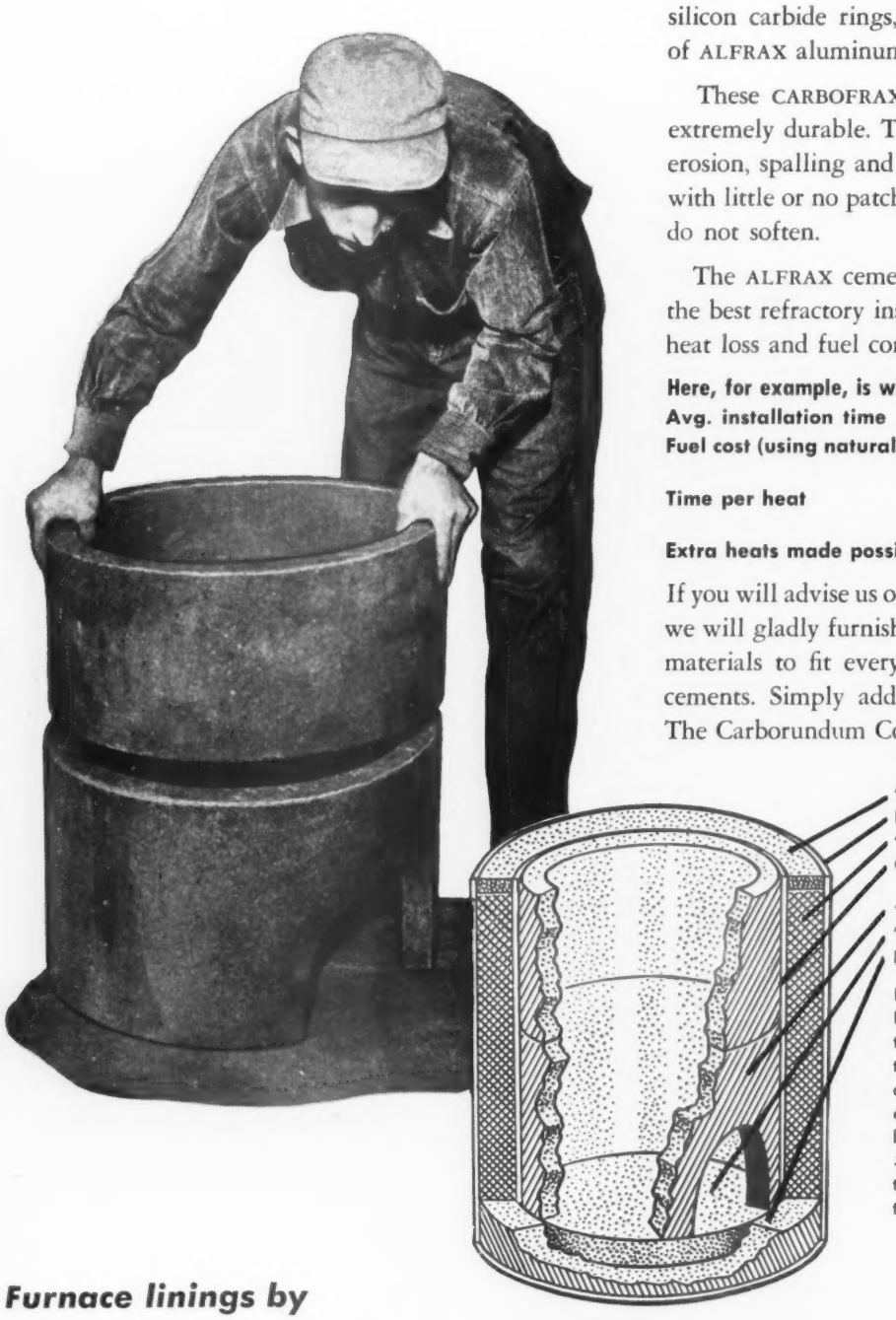
These CARBOFRAX rings are exceptionally dense, and extremely durable. They are inherently resistant to flame erosion, spalling and cracking, and will go many months with little or no patching. Even at high temperatures, they do not soften.

The ALFRAX cement that backs up the rings is one of the best refractory insulating materials available. It keeps heat loss and fuel consumption to a minimum.

Here, for example, is what one foundry reports on these linings.

Avg. installation time	**— 2 hrs. per lining**
Fuel cost (using natural gas)	**— $.0015 per lb of manganese bronze melted**
Time per heat	**— 40 min. (moreover, it's now a *consistent* 40 min.)**
Extra heats made possible	**— 1 per day, 2 if necessary**

If you will advise us of your particular operating conditions we will gladly furnish recommendations. We make lining materials to fit every need — rings, ring segments, and cements. Simply address Dept. A-22, Refractories Div., The Carborundum Co., Perth Amboy, N. J.



Here's a typical ring/cement lining. The CARBOFRAX ring lining is only 1½" thick — hence, there's more space for insulation, better protection against heat loss. • Castable ALFRAX cement #27 is used to back up the rings. (It's easy to install — just mix with water and handle like Portland cement.) • CARBOFRAX cement #30 is rammed in the bottom and is used to top off the ALFRAX lining. It's highly resistant to abrasion.

Furnace linings by

CARBORUNDUM

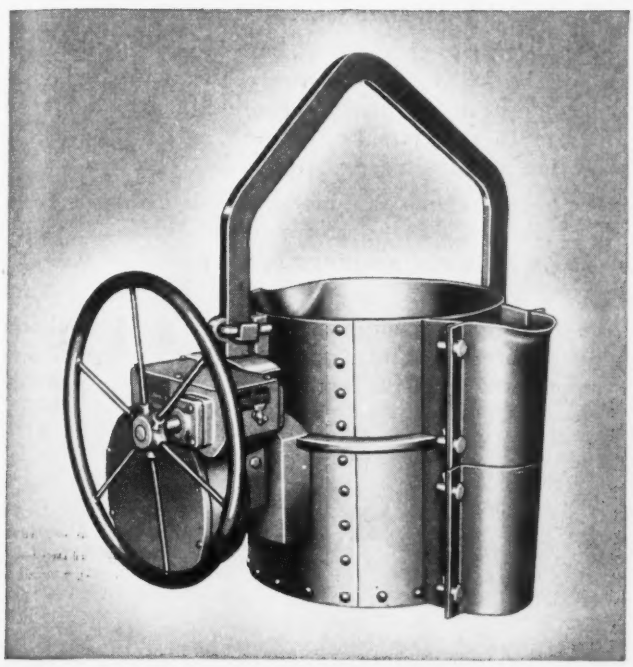
Trade Mark

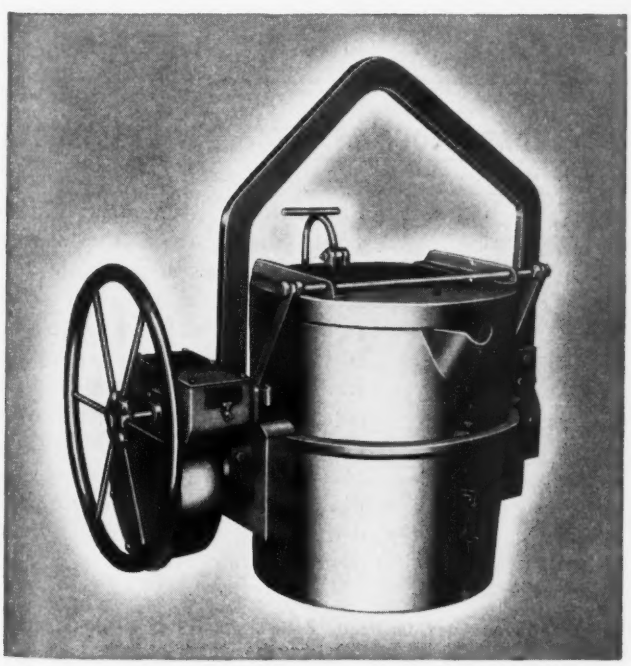
for lower cost installation . . . operation . . . maintenance

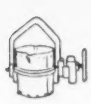
"Carborundum", "Alfrax", and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company.

YOU'LL FIND THE TYPE LADLE YOU WANT AT

Ladle Headquarters







LADLES

SHANKS

BOWLS

TONGS

Industrial Equipment has all the ladles: teapot spout . . . covered . . . cylindrical . . . reservoir . . . buggy . . . bottom discharge . . . and many others, standard and special.

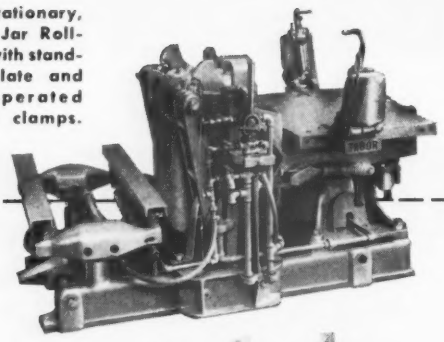
Each represents the last word in proven design and operating efficiency. All Industrial Crane Ladles are available with Industrial's revolutionary new universal bail which completely eliminates binding from heat or misalignment.

All geared ladles use Industrial's new hi-safety, self-locking worm gearing which uses no gaskets and which can be easily adjusted by anyone.

Write for Industrial's latest catalog. Illustrations, sizes, dimensions, technical features: all are included.

Industrial
EQUIPMENT COMPANY
115 NORTH OHIO ST., MINSTER, OHIO

22" Stationary, Plain Jar Rollover with standard plate and air-operated single clamps.



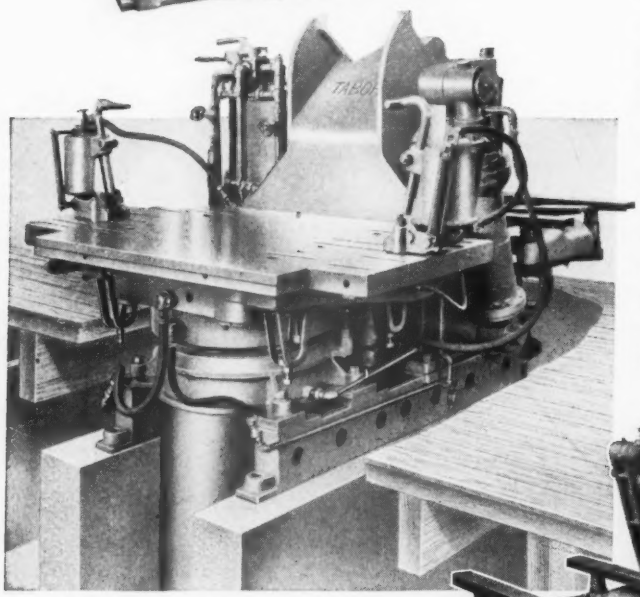
Why TABOR

Pictured here are three Tabor Rollovers—ranging in capacity from 600 to 3,000 pounds—that are "polishing halos" for foundry production superintendents the world over.

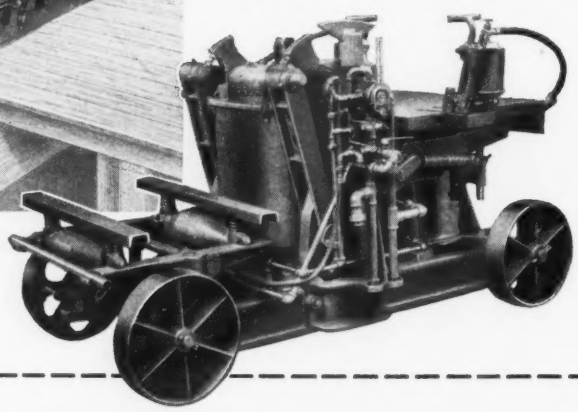
All are *completely* power operated. You can choose between plain jar or shockless jar (so *shock-free* that a finished mold awaiting removal on the drawing side will not be damaged if the operator fills and jars the next mold). The 22" and 30" Shockless Jar Rollovers are portable.

All incorporate Tabor's famous air-on-oil principle for a smooth, perfect draw. All perform up to full rated capacity, completing a cycle of operations in the *fractional part of a minute.*

Study the other features emphasized here. Write for Bulletin #514, just off press, and team up with Tabor for a quick and happy solution to any Rollover problem.



40" Rollover with standard plate and air-operated single clamps.



30" Portable, Shockless Jar Rollover with standard plate and air-operated single clamps.

Now... TABOR'S NEW PLATE-LOCKING DEVICE IS STANDARD EQUIPMENT ON MACHINES SHOWN

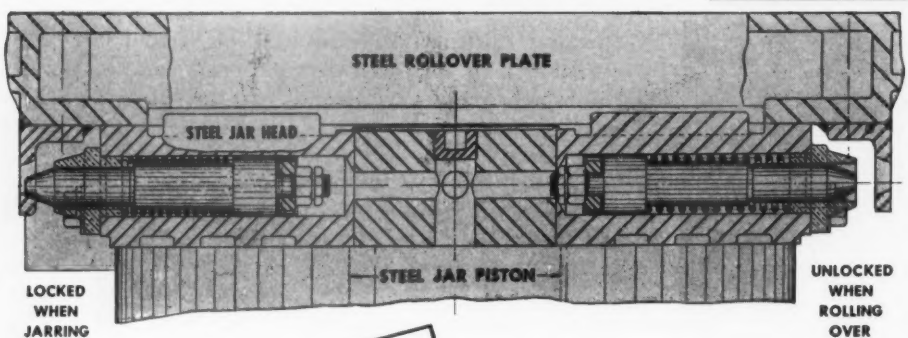


Plate wobble when jarring is gone forever, and the sketch shows why. Rollover plate and jarring head are locked into *one rigid unit* the moment jarring air is introduced—a feature exclusive with Tabor! 25% better jarring blow—equal ram all over the mold—no "secondary jolt"; plate and head last longer—no plate wobble, even when handling work with uneven weight distribution.

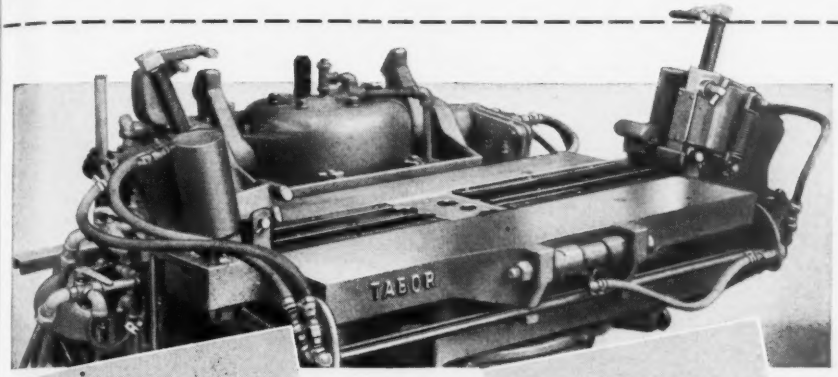
***Note for long life*—Rollover Plates, Jar Heads, and Jar Pistons on machines shown here are made from *steel castings or forgings*—another newly-adopted standard!**

REPRESENTATIVES

Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

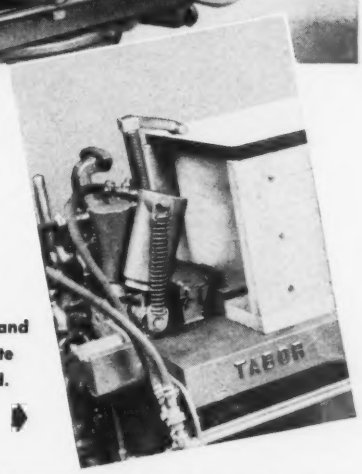
save labor.

Rollovers Work Miracles!



Core box clamped.

Core box and core plate clamped.



ANOTHER PRODUCTION BOOSTER—QUICK CHANGEOVER PLATE and DOUBLE CLAMPS!

Designed for super-speed changeover. Air-operated, double clamps slide in grooved rollover plate. All four clamps operate independently. Hold core box and core plate to machine without need for other clamping devices. Clamp pattern boards, flasks, bottom boards. Adjust immediately to new pattern board sizes without need of set-up man or tools. All machines shown here available with standard plate and single clamps or with quick changeover plate and double clamps.

MODERNIZE YOUR PRESENT TABOR ROLLOVER!

If your present Tabor Rollover is in the 600 to 3,000 pound capacity range, you can easily install any or all of these new features to great advantage. Give it the benefit of a plate, jar head, and jar piston made of *steel*. Add the new plate-locking device, whether or not your plate needs replacing. Or, substitute a quick changeover plate with double clamps for greater versatility.

SPECIFICATION TABLE

Size of Machines	Sizes of Rollover Plates		Length of Pattern Board when using Flask Clamps		Height Plate from Floor		Max. Space for over-all depth of Flask, Pattern Board and Bottom Boards	Draw	Capacity (lbs.)
	Width	Length	Min.	Max.	Plain Jar	Shockless Jar			
22″	22″	42″	16″	43″	25″	29″	17½″	10″	600 lbs.
30″	30″	40″	20″	53″	27¾″	32¼″	20½″	12″	1000 lbs.
40″	40″	50″	24″	56″	15″	15″	*43″ Minus draw required	15″	1500 to 3000 lbs.
40″	40″	60″	24″	66″	15″	15″	*43″ Minus draw required	15″	1500 to 3000 lbs.

*40″ machines can be furnished with 55″ max. space for over-all depth, which allows approx. 20″ draw. (Height of plate from floor—20″)

The TABOR Manufacturing Co.

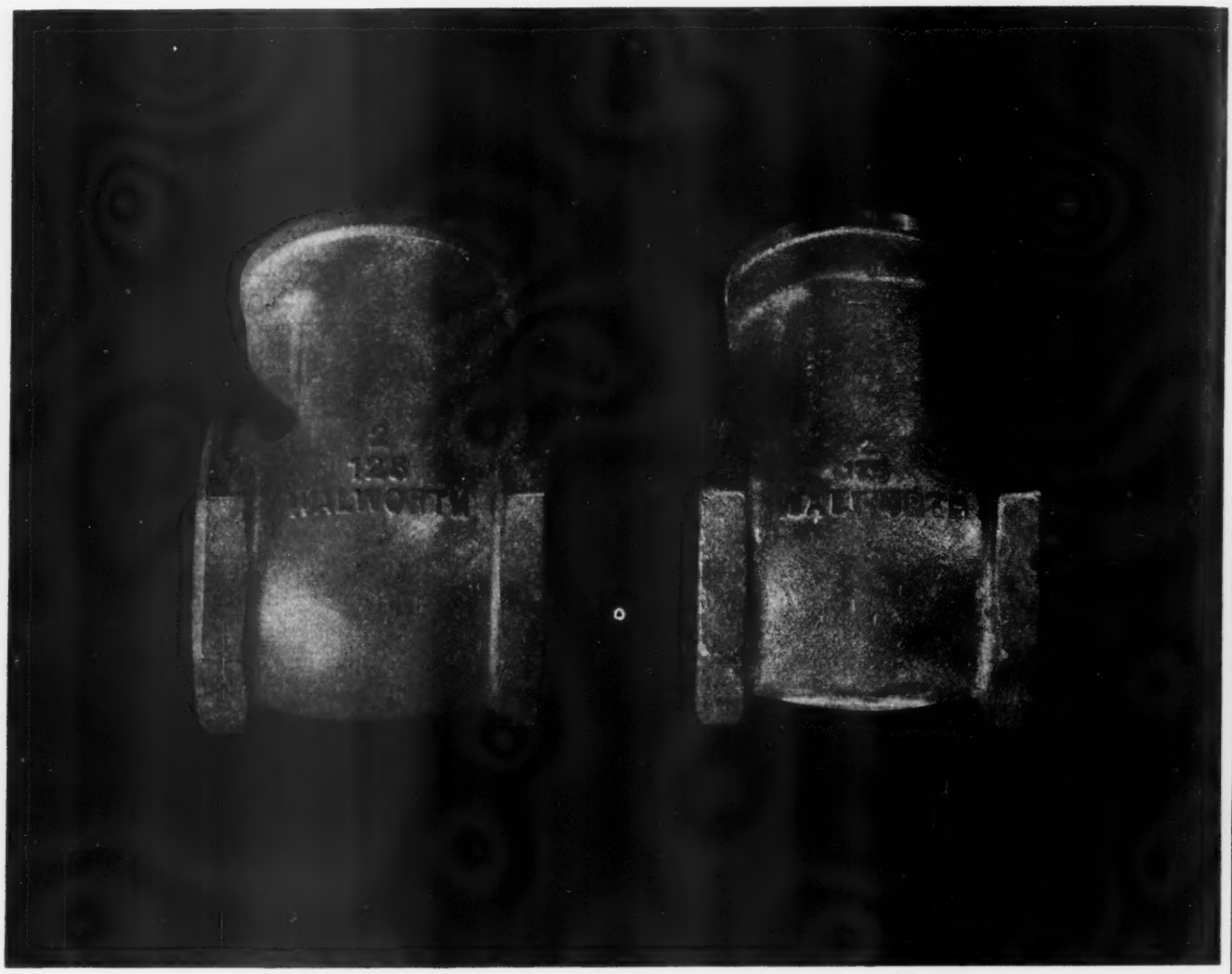
SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES

6225 TACONY STREET • PHILADELPHIA 35, PENNA.

Export Department, 765 Drexel Bldg., Phila. 6, Pa.

. . . buy Tabor

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA



Valve castings by Walworth Company, South Boston, Mass. Casting at left is from a "C" Process shell mold. Note smooth surface compared with conventional casting at right.

COSTS SKID ON SMOOTH CASTINGS

Casting 2-inch valve bodies like the one above at left with thin-shell sand molds made by the Croning Process – saves Walworth Company at least 5 per cent in the amount of metal poured.

Bonded with BAKELITE Phenolic Resins, thin shell molds and cores for ferrous and non-ferrous casting bring other important savings compared with the use of conventional green sand molds. Almost pattern smooth castings, with tolerances as close as .003 to .004 inches per inch, cut down finishing time. And since the molds permit venting of gases more thoroughly during pouring, rejects are reduced to a minimum.

Other advantages:

- Molds and cores can be baked in 30 seconds to two minutes – in quantity with uniform quality.
- Built-in dowel pins and holes assure accurate registration of mold parts.
- Dimensionally stable, moisture-resistant molds and cores can be stored for long periods.
- Light weight, less handling fatigue.

To learn more about how thin shell molds and cores cut foundry costs, improve quality and speed output, fill out and mail the coupon today.

Dept. DN-29, BAKELITE COMPANY,
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

Please mail at once my free copy of the booklet "BAKELITE Phenolic Resins for Foundry Molds and Cores."

*Name*_____ *Title*_____

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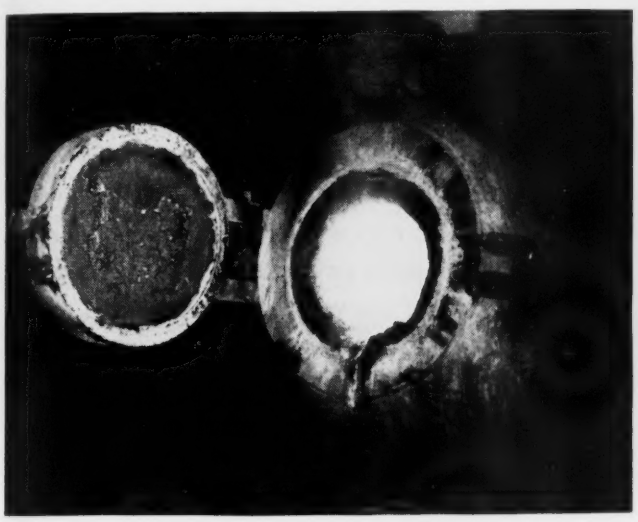
BAKELITE
TRADE-MARK
PHENOLIC BONDING RESINS

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

AN OUTSTANDING CEMENT *For Your Non-Ferrous Metal-Melting Furnaces*



Norton CRYSTOLON RC1188 Offers Many Money-Saving Advantages*

In **CRYSTOLON RC1188** you have a cement developed by Norton especially for lining crucible and reverberatory furnaces — and ladles — processing non-ferrous metals.

A dense, easily workable, coarse grain cement, RC1188 is particularly suitable for ramming-in linings and for patching, and its very high refractoriness withstands temperatures up to 3050° F. Adaptable, easy to install and repair, it has high "green" strength, with long service life assured by excellent resistance to slag, flame and mechanical abrasion, spalling and cracking.

GET THE WHOLE STORY

on CRYSTOLON RC1188 and other Norton refractory cements in this illustrated booklet, which includes a selection table covering the range of applications. Ask your Norton Representative for Form 863 or write to NORTON COMPANY, 310 New Bond Street, Worcester 6, Massachusetts.

NORTON FIRED SHAPES are available in the form of brick or segmental linings, in a variety of refractory materials for best results in non-ferrous metal-melting furnace applications. See your Norton Representative.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

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Special REFRACTORIES

Making better products to make other products better

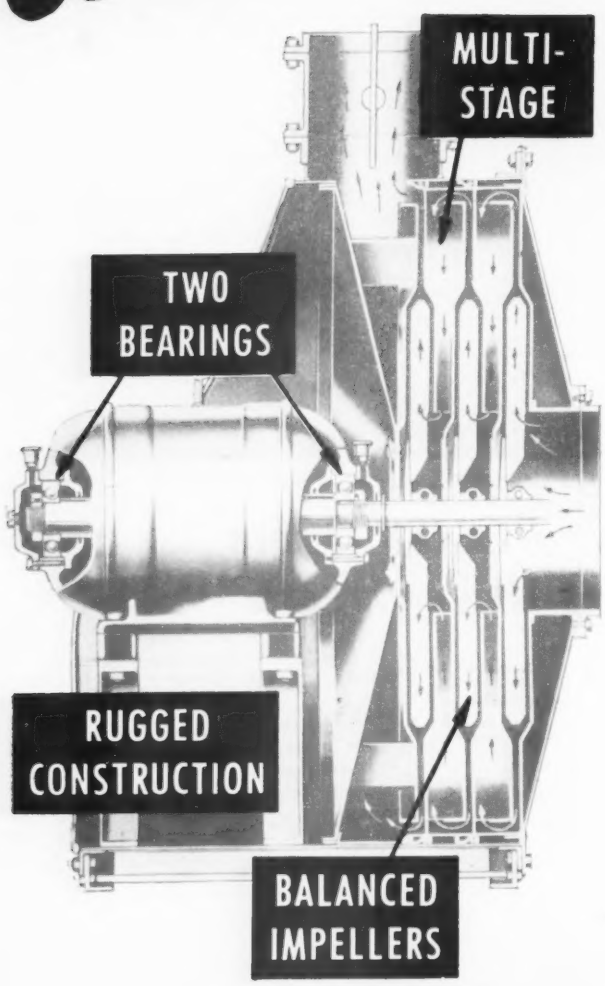
Canadian Representative

A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

CONTINUOUS PRODUCTION

Assured 4 Ways

WITH SPENCER TURBO-COMPRESSORS



There are good reasons why the annual installation of Spencer Turbos has increased tenfold in ten years and why a recent analysis shows that repair parts amount to less than one dollar per machine per year.

No. 1. The Spencer multi-stage construction allows a smaller diameter machine with lower peripheral speeds of the fan blades and of the motor itself. The wear on the bearings is therefore cut to a minimum.

No. 2. The only rotating contacts are at the two ball bearings, which if kept greased will assure satisfactory operation without work stoppages for many years.

No. 3. Here is a machine as simple as an electric fan, with a rugged construction, as sturdy as a steel bridge and with wide clearances between the rotating elements and stationary parts. Users say "the Spencer goes on forever with little attention."

No. 4. Balanced Impellers. Each fan is individually balanced before the machine is assembled. This decreases the vibration, increases the life of the bearings and packing and produces quiet performance.

35 TO 20,000 C.F.M.; 4 OZ. TO 10 LBS.; 1/3 TO 1,000 H.P.

440-H

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER
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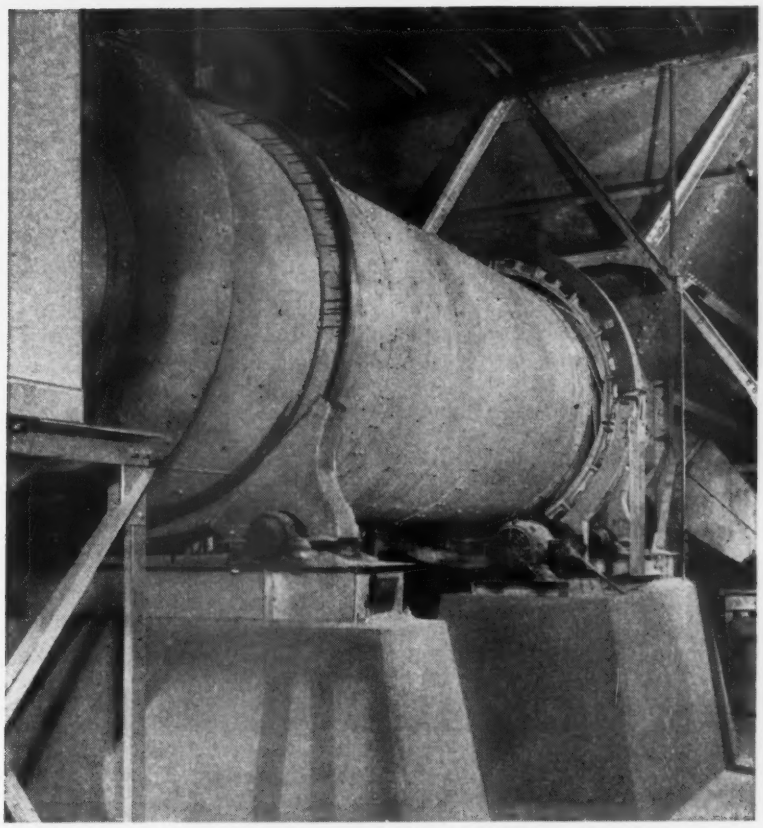
Get more dry, cool sand... in less floor space



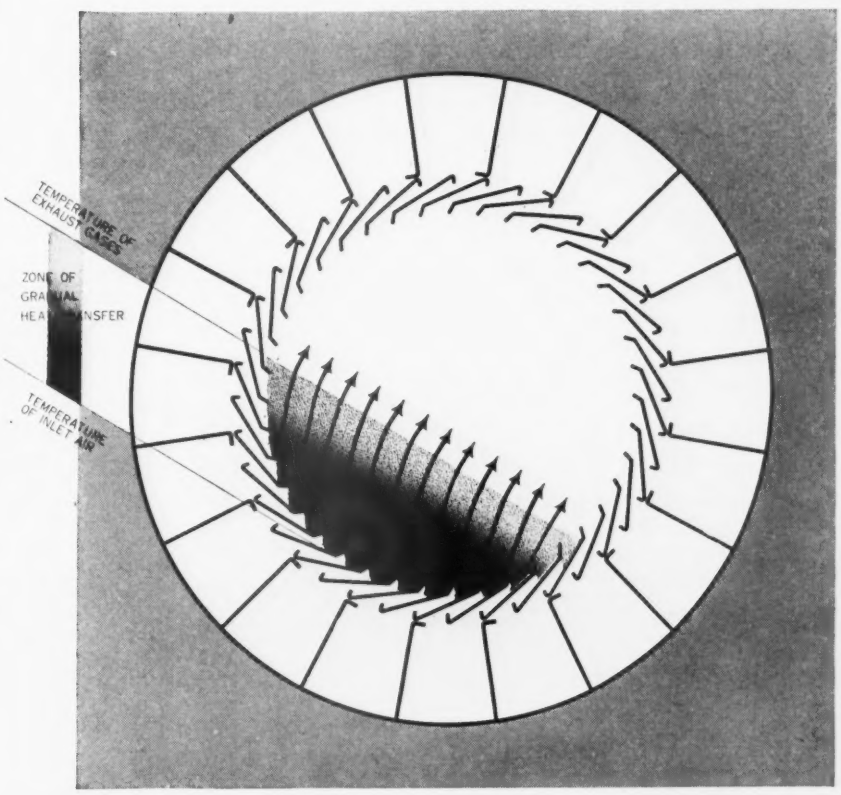
Drying 10 tons of core sand per hour, this Link-Belt Roto-Louvre Dryer is used with a gas-fired furnace and dust-collecting system.

LINK-BELT Roto-Louvre Dryer delivers large volume of dry sand ... at cool discharge temperatures

MODERN, mechanized foundries require cool, dry sand for cores and molds . . . and lots of it! High capacities call for high temperatures. And with ordinary dryers that means an extra cooler — or sand so hot it won't mix properly with core oil and is difficult to handle.

But not with Link-Belt's Roto-Louvre Dryer! Here's a unique design that utilizes controlled high temperatures for high capacities . . . delivers sand at 120 to 130° F with a moisture content of only 0.5%. What's more, it takes only half the floor space required by other drying equipment.

Book 1911-A has the complete story on Roto-Louvre Dryers. Or you can get all the facts from your Link-Belt foundry specialist.



Gradual Heat Transfer Assures Uniformly Dry Sand

Gentle rolling action over slowly revolving louvres results in uniform treatment, thereby eliminating spotty over- or under-drying. Gradual drying of the sand, as it progresses through the Roto-Louvre Dryer, affords a uniform moisture content of the product at a low final temperature.

LINK-BELT

HANDLING and SAND PREPARATION MACHINERY

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,550

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Railroads are particular!

Some of the most rigid purchasing standards of modern business are set by the American railroads. Whatever they buy is thoroughly checked and when selling to them the rule of thumb is, "It has to be good!"

THEY DEMAND SOUND CASTINGS FOR SAFETY...

Especially strict are their standards for metal castings. For oftentimes the safety of all their passengers may rest on the strength of these foundry products. Sound castings are made, not born—made with top quality foundry sand backed by exacting quality control.

at SCULLIN STEEL SOUND Castings are made with Sand from **AMERICAN SILICA**

The pouring room at Scullin Steel Co. where sound castings are made with sand from American Silica.

Scullin Steel's finishing room with rows of railroad castings waiting for shipment.

Suppliers of: Crude and dried crude silica sand • SULTRON® flux • Australian zircon sand • Zircon flour

®SULTRON is the trademark of Westvaco Chemical Division, Food Machinery and Chemical Corporation, for its brand of sodium sequicarbonate.

USCO D-3

USCO D-3—only one of several standard sand casting alloys in the USCO D series—is a 4% Cu—3% Si Aluminum Alloy that conforms to Federal Specification QQA-601a—Class 8.

When you use USCO D-3 for your castings, you are assured of consistent uniformity of analysis and the mechanical and physical properties you desire. The result for YOU is fewer rejects with lower production costs and increased volume — money in YOUR pocket!

Our metallurgical engineers, who have a practical working knowledge of your problems, are at your service always. They can often suggest a satisfactory substitute for a high grade aluminum alloy that under existing conditions is sometimes not readily available.

The real test of USCO Aluminum Ingot is what it does for YOU. Prove it to yourself.

FREE Send for your copy of the USCO Aluminum Alloy Selector. A handy aid to analysis, specifications and many other foundry problems.

For 47 years, pioneers in aluminum development.

USCO **U. S. REDUCTION CO.**

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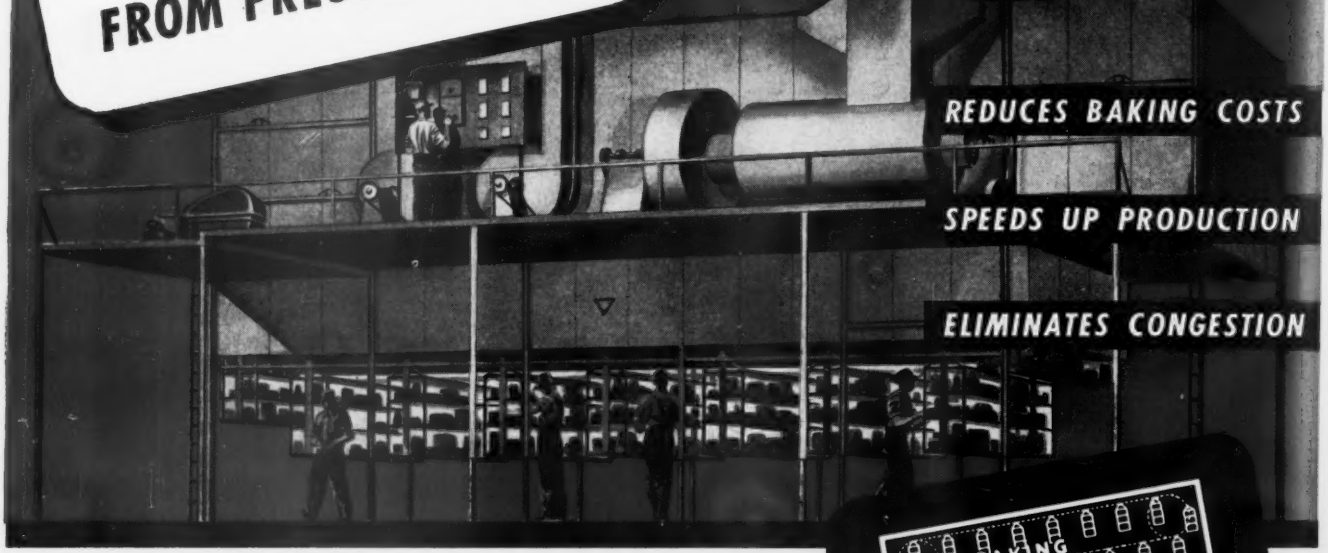
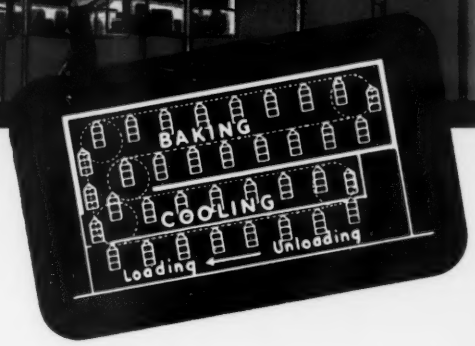
GET MORE WORKING SPACE FROM PRESENT PLANT

DESPATCH

ELEVATED CONTINUOUS CONVEYOR

CORE BAKING OVEN





DESPATCH combination gas-oil fired oven, 13 ft. wide, 27 ft. high, 52 ft. long. Has variable speed continuous conveyor. Cores make horizontal passes thru bake chamber, (see diagram) then enter fan-equipped cooling section.

DESPATCH conveyor ovens help boost core output-per-man as loading and handling are greatly simplified. Foundrymen appreciate the labor-saving features of DESPATCH Conveyorized Ovens.

Intermittent monorail conveyor DESPATCH oven with swing doors at both ends.

DESPATCH core and mold oven with heavy duty, electrically operated lift door.

This ingeniously designed DESPATCH oven gave foundrymen more working space from their present plant and increased core baking output at the same time. It provides ample baking capacity up to 84 tons per day and gives the foundry much needed floorspace. The oven is built to carry 38 long (7½′ x 2′ x 3′) core racks suspended from a continuous conveyor chain.

DO THESE ADVANTAGES INTEREST YOU?

1. SAVES FLOORSPACE: Platform-mounted heater, fans, controls, plus compact overall design, allow more work space on foundry floor.

2. ALLOWS FAST, EASY HANDLING: Built-in cooling section provides fast, uniform cooling. Eliminates fumes. Provides speedy unloading and reloading without delay.

3. STRAIGHTENS COREMAKING LINES: Unique design permits single open loading—unloading area, easily reached from all sides. Accommodates wide range of core sizes.

4. REDUCES BAKING COSTS: Efficient system recirculates up to 75% of heated air. Guarantees fast, even, low-cost baking.

Write today for Bulletin 30N

Minneapolis Office:
619 S. E. 8th St.

Chicago Office:
4554 Broadway

DESPATCH OVEN COMPANY

What's U. S. Rubber doing to cut "gray iron" grinding costs?

The workman is grinding a giant counter weight for use on an industrial crane. He uses U. S. Royalite Cup Wheels, which are best suited for grinding such tough iron.

Specialists in abrasives at "U. S." have developed grinding wheels which grind fast and stand up well when used on castings of the toughest gray iron. That is why, like many a "U. S." customer, the foundry in which these pictures were taken uses "U. S." wheels exclusively.

For over 88 years, "U. S." has been developing wheels for the immense range of foundry grinding problems. Let U. S. Rubber technicians study your own requirements.

GRINDING A SEWER GRATE so it will fit smoothly into its frame. The grate must fit precisely or a tendency to rock will arise. Here again, U. S. Royalite Cup Wheels are used because the iron is of the toughest kind.

PRODUCTS OF U.S.RUBBER SERVING THROUGH SCIENCE

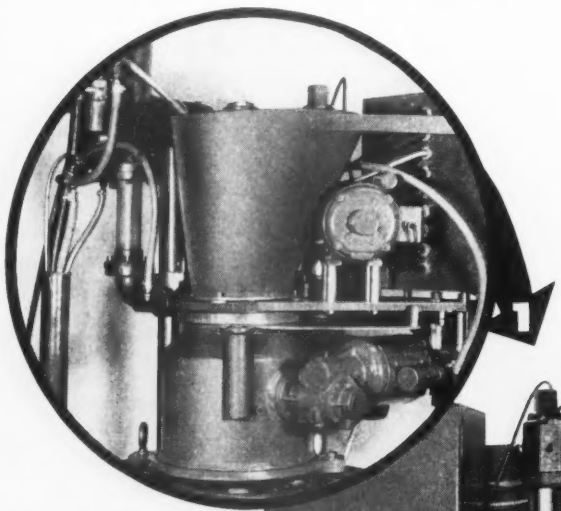
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

IT'S NEW! IT'S MODERN! IT'S FAST

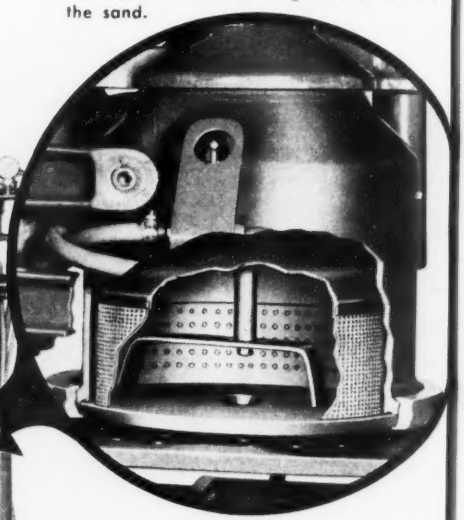
Federal presents the

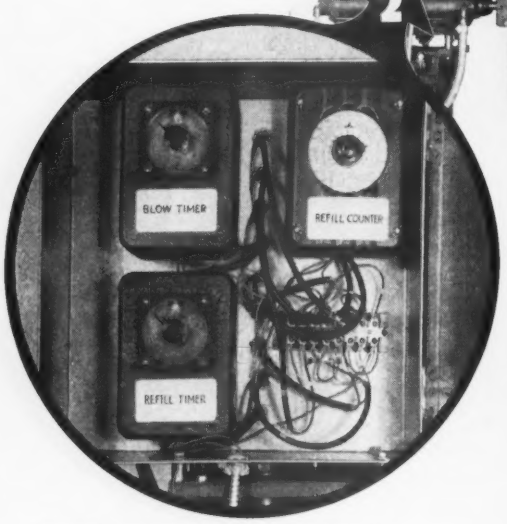
NEW for '52 FULL-AUTOMATIC "SAN-BLO"



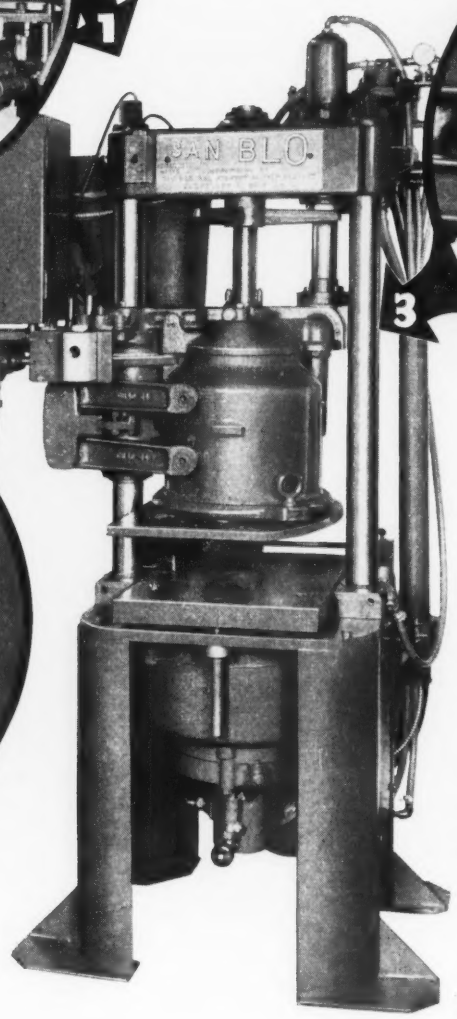
Large sand hopper with motor-driven agitator, for automatic refilling of sand magazine, is located at rear of machine for convenient loading from above.

Cut-away view of sand magazine showing motor-driven plows that move sand and prevent "piping" and "bridging"—and fine mesh screen through which air is delivered into lower section of magazine to aerate the sand.





Control box contains (1) electric timer for blowing cycle, (2) electric counter for controlling movement of sand magazine to hopper, (3) electric timer for holding sand magazine under hopper for filling.



- **Quick Job Changes**

  One adjustment wheel quickly raises or lowers sand magazine to accommodate core box. Sand magazine is standard—is never changed.

- **Wide Range of Core Boxes**

  The SAN-BLO will blow all cores from the smallest to those weighing 40 lbs. each—and blow them all from its one standard sand magazine.

- **80% Sand Delivery**

  The SAN-BLO blows 40 to 42 lbs. of its 50 lb. magazine load because sand is moved mechanically to the blow hole. No "piping" or "bridging".

- **Automatic Safety Features**

  Air pressure is cut off automatically while sand magazine is being refilled. Blowing cycle cannot start unless the core box is in blowing position.

- **Clean Operation**

  Precision construction prevents sand leakage or blow-by—making SAN-BLO the cleanest-operating core blower.

FEDERAL

DETROIT
CHICAGO
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CLEVELAND

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 EAST 71st STREET • CLEVELAND 5, OHIO

TOMORROW'S CORE BLOWER . . . TODAY!

The NEW FOR '52 "SAN-BLO" — the fastest, most efficient core blower! Time consuming, manual operations are performed by electric controls, described below. Complete operation of blowing cycle is reduced to simply pressing one starting button—the controls do the rest. The amazing new controls are *plus* features, in addition to SAN-BLO's motor-driven plows and aerating air circuit. These exclusive design features made possible for the first time the successful blowing of *any* core sand that could be hand-rammed, and blowing *any* size core up to 40 lbs. without changing sand magazine.

BLOWS 10 LB. CORES in 2½ SECONDS — 40 LB. CORES IN 5 SECONDS

In only 2½ seconds from the time the starting button is pressed, a uniform, accurate 10 lb. core is ready to be taken from the machine. In only 5 seconds, a 40 lb. core. The ultimate in fast production of high quality cores made from *any* core sand mixture.

AUTOMATIC, ELECTRICALLY-TIMED FILLING OF SAND MAGAZINE

The large sand magazine does *not* require refilling after each blow. An electric counter controls automatic refilling. At intervals, depending on size of core being blown, magazine automatically swings back under hopper, fills and returns to blowing position. Motor-driven agitator in sand hopper provides immediate filling of sand magazine, and operates only when magazine is in filling position. See photo No. 1.

AUTOMATIC, ELECTRICALLY-CONTROLLED BLOWING CYCLE

An electric timer, graduated in seconds, provides correct timing of the blowing cycle. Size of core and type of sand being blown govern setting of timer. Fixing the time of the blowing cycle assures a steady production of uniform cores. See photo No. 2.

MECHANICAL MOVEMENT OF SAND IN SAND MAGAZINE

Motor-driven plows, which operate only during blowing cycle, revolve in lower part of sand magazine, move sand mechanically to blow hole and keep an even distribution of sand over entire blow plate. *No* "piping" or "bridging" in sand magazine at any time. An "aerating" air circuit feeds air, under full pressure, through a fine mesh screen which forms the lower inner wall of the sand magazine. By aerating the sand and moving it mechanically, SAN-BLO can blow *all* types of core sand and blow them to uniform hardness. See photo No. 3.

AUTOMATIC DRAWING OF CORE FROM COPE OF CORE BOX

An air-oil controlled clamping table, with 6" stroke, provides vertical clamping of core box. By fastening the cope half of core box to blow plate and blowing into a drier, core can be drawn from the cope. By setting up a conveyor system at rear of machine, cores on driers can be ejected as empty driers are inserted in blowing position from the front.

OPERATION—Initial setting of controls is simple and need be done only once for an entire run of any core: (1) set blowing cycle timer, (2) set refill counter, (3) set refill timer, (4) adjust sand magazine position, (5) set core box stop. After these settings, the only operations are to insert box, press starting button and remove box.

THE FEDERAL FOUNDRY SUPPLY CO.
4600 East 71st Street
Cleveland 5, Ohio

MEMBER FEMA

Please send me a copy of your free catalog No. CB-3, describing the new FULL-AUTOMATIC "SAN-BLO" and other models available.

*Name*_____ *Position*_____

*Company*_____

*Street*_____

*City*_____ *Zone*_____ *State*_____

PSC

Light-Weight

ANNEALING EQUIPMENT

in Any Size

From mammoth covers requiring a flat car for shipment to midget boxes you can hold on a hand, PSC annealing equipment is made in any size that will help you get minimum handling time and maximum furnace capacity. Efficiently sized PSC containers recently increased by 100% the output of the furnaces of a well-known malleable foundry. In each furnace 22 stands of PSC light-weight sheet alloy boxes replaced 18 stands of bulky, space-wasting cast boxes, resulting in doubled capacity.

Heat-Treating Equipment for Every Purpose

Carburizing and Annealing Boxes
Baskets · Trays · Fixtures
Muffles · Retorts · Racks
Annealing Covers and Tubes
Pickling Equipment
Thermocouple Protection Tubes
Radiant Furnace Tubes & Parts
Heat & Corrosion Resistant Tubing
Tumbling Barrels · Tanks
Cyanide and Lead Pots

Weigh Up to ⅓ Less. Cut Handling and Fuel Costs.

PSC welded alloy units save time because, being 2/3 lighter than cast equipment, they handle faster; and require less time to attain pot heat. A recent study of one customer's cycle showed a total saving of 5 hours. By repeated records, their service life is 2 to 7 times that of cast units. Let our technical staff work with you in devising time-saving units. As pioneers of light-weight, sheet alloy, heat-treating containers and fixtures, we make available to you a wealth of designing and production know-how. We fabricate in any alloy. Send blue-prints or write as to your needs.

The PRESSED STEEL Co. PSC

THE PRESSED STEEL COMPANY
of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆

It's Results that Counts!

● There may be an attraction to some molten iron fluxes due to lower price, but the picture changes quickly when your foundry compares the results with those obtained by using—

Famous CORNELL CUPOLA FLUX

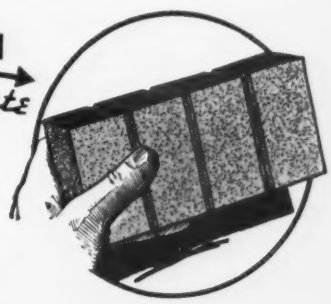
You take no chances with Famous Cornell Cupola Flux. It is backed by a record of more than 34 years' success in casting improvement—in both gray iron foundries and malleable foundries with cupolas.

Ask the user. **He knows that Famous Cornell Cupola Flux does a *thorough* job of cleansing molten iron, that it makes iron more fluid and reduces sulphur—and he'll tell you that their castings are sounder, cleaner and easier to machine, and greatly reduced rejects facilitates better deliveries.** ***We'll gladly furnish you with names of a few users nearest you.***

WRITE FOR BULLETIN NO. 46-B

SCORED BRICK FORM

Easy to use, Prevents Waste



FAMOUS CORNELL CUPOLA FLUX ALSO ENSURES MORE EFFICIENT CUPOLA OPERATION. Cupolas are kept cleaner. Bridging over is practically eliminated. A glazed or vitrified surface is formed over cupola lining, minimizing erosion. Maintenance time and labor is reduced amazingly.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

BRASS FLUX

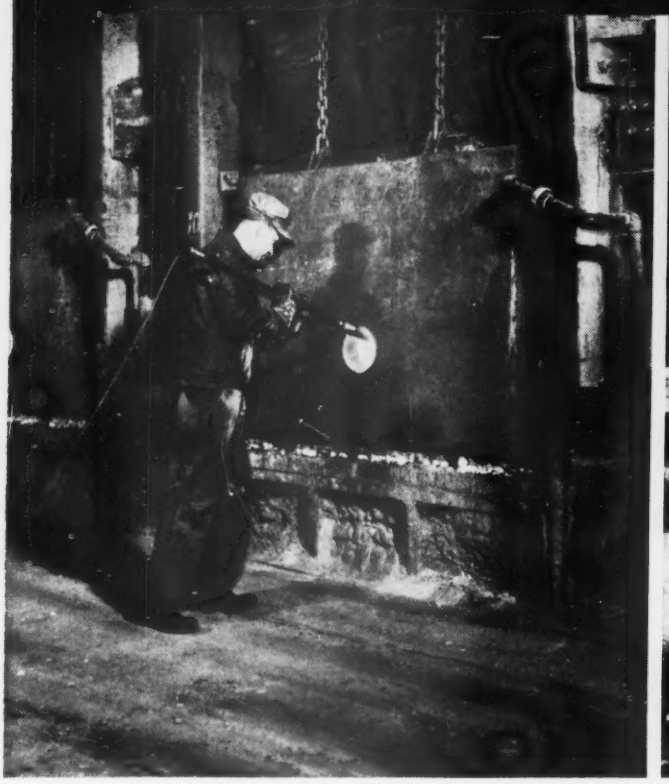
FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

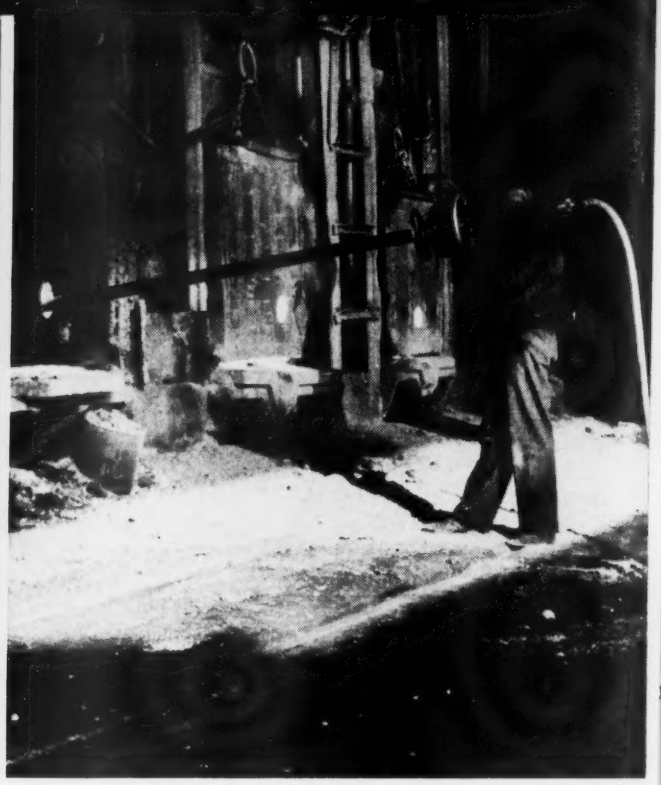
ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

FOR MORE INGOT TONNAGE PER HEAT

Measure Temperatures By Immersion Thermocouple or Immersion Rayotube

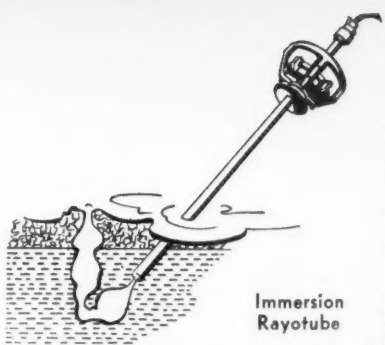




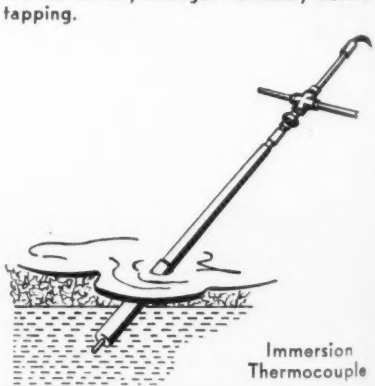
OPEN HEARTH and electric furnace shops can now choose between two tested L&N methods for measuring steel temperatures during the melt. Either an Immersion Rayotube or an Immersion Thermocouple is plunged momentarily beneath the surface to measure the temperature of the bath, while a dependable Speedomax Recorder displays the information where all concerned can use it.

Either method helps improve ingot production by warning if the steel is too hot or too cold for tapping. Recently published talks before national steel associations indicate that production losses have been sharply cut in plants where temperature is properly measured while the melt is finished off for tapping.

It pays to select your immersion-measuring equipment from a source which makes both radiation and thermocouple types. The two equipments cost about the same initially; among the factors which should be weighed without prejudice are: size and type of furnace, type and quality of steel, experience of helpers in using instruments, supervisory set-up and the differences in maintenance supplies and labor. If you'll contact our nearest office, or 4917 Stenton Ave., Philadelphia 44, Pa., we'll be glad to supply such other information as you desire.



Rayotube gets its reading inside a bubble blown by compressed air or other gas, while Thermocouple contacts the metal directly. Both methods give the "heart" temperature of the molten steel, and give it in time for any changes necessary before tapping.



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LEEDS & NORTHRUP CO.

Jrl. Ad. ND46-33B-0661(1)

MACLEOD

DUST ARRESTERS
BLAST EQUIPMENT
FOUNDRY SUPPLIES

EST. 1897

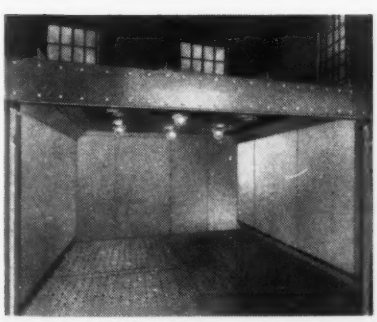
Filter tube tops are fitted with suspension caps with eye hooks that fasten to shaker grid and springs. Bottoms are held by clasps, over steel tube collars.

Macleod Dust Arrestors Filter Tube Type

A modern, efficient dust collector preferred by modern foundries. Cloth tube type—easy to replace. Available with manual or automatic tube shakers. Equipped with standard hopper valves but can be furnished with rotary valves if desired. Screen types also available—with manual or automatic positive screen rapping mechanism.

Macleod Blacking Swab Sprayers

Especially designed for foundry use. Work on the suction principle and require compressed air to operate. Sprays liquid facing on dry sand molds or oil on dry sand cores. Made in steel, brass, and copper and in four sizes—1 to 5 quart capacities.



Macleod Blast Rooms

Available in standard sizes or in special sizes to meet individual requirements. Designed for use with Macleod automatic or semi-automatic or manual blast cleaning machines.

Write for additional information or send specifications for estimate.

The MACLEOD Company

2232-40 BOGEN ST. CINCINNATI 22, OHIO, U.S.A. *ESTABLISHED 1897*

KEEP CASTING QUALITY HIGH
WITH THE HELP OF

SMITH L-O CORE OIL

WAREHOUSE STOCKS
AVAILABLE
In The Following Cities

- COLUMBIAN WAREHOUSE CO. Reading, Pennsylvania
- FOUNDRY SERVICE CO. Birmingham, Alabama
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- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. *(formerly M. W. Warren Coke Co.)* St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon

Quality castings arise from a number of things — chief among them — sound, accurate cores. And, for cores you can depend upon, you'll get best results with Smith L-O Core Oil.

This time-tested, work-tested binder comes in many grades to meet virtually all casting conditions—regardless of the kind of sand used or oven capacity requirements, Smith L-O fast drying is available.

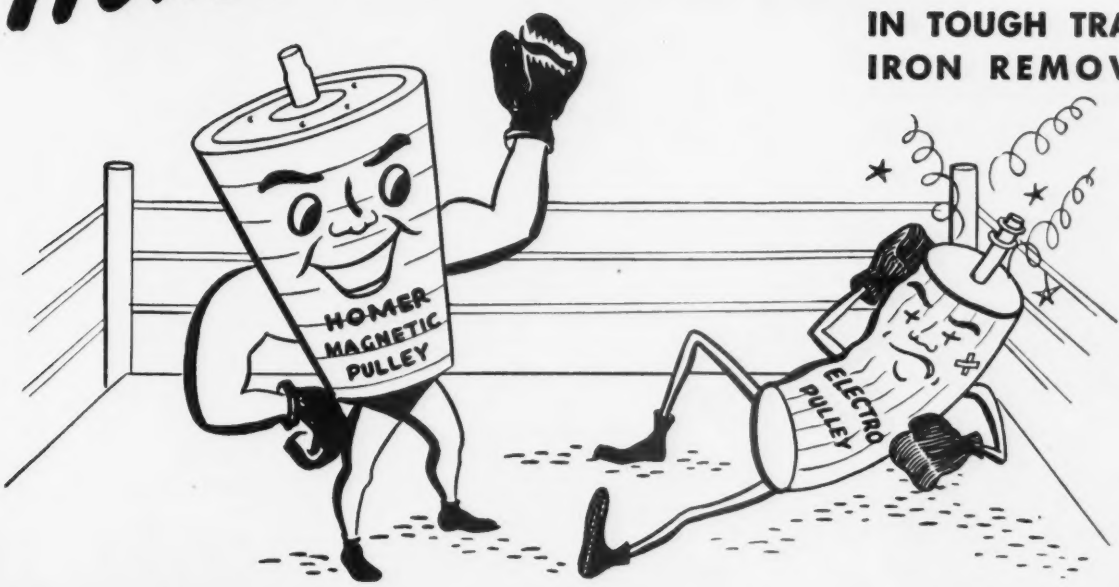
Smith L-O *Core Oil*

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

Homer the Winnah!

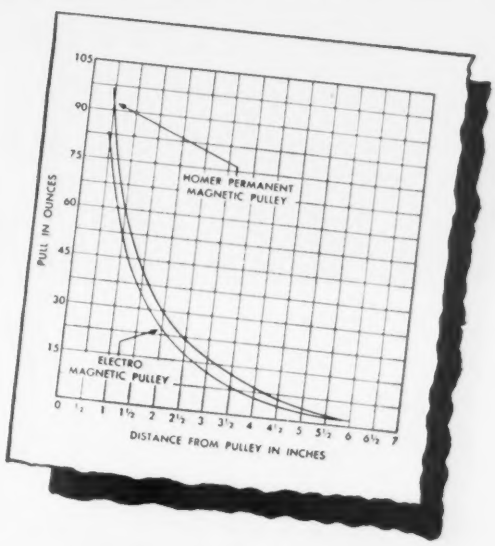
IN TOUGH TRAMP IRON REMOVAL

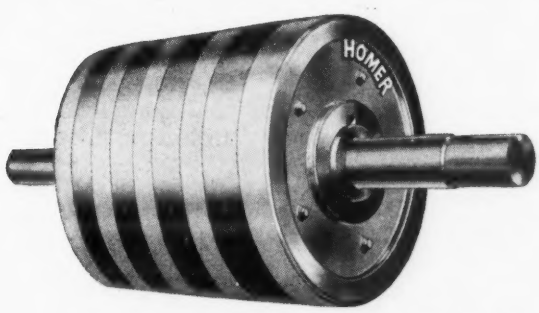


GUARANTEED PERMANENT MAGNETIC PULLEYS

There's no denying that Homer Heavy-Duty Permanent Magnetic Pulleys are winners in extra-tough bouts in separating ferrous from non-ferrous materials.

Efficiency and comparative tests have been made both by our own engineering department and by an unbiased outside testing laboratory . . . the results are shown plotted on the graph at right, proving that Homer Heavy-Duty Pulleys do equal or exceed the strength and efficiency of electro magnetic pulleys.





Homer Permanent Magnetic Pulleys are available in Standard and Heavy-duty sizes of 12", 15", 18", and 20" diameters, with belt widths from 4" to 60". Sizes in 24" and 30" diameters available for Light, Standard or Heavy-duty service, with belt widths from 20" to 60". Write for Literature.

MAGNETIC PLATES
MAGNETIC PULLEYS
MAGNETIC DRUMS

HOMER

MAGNETIC TRAPS
MAGNETIC DUCTS
MAGNETIC SWEEPERS

THE HOMER MANUFACTURING CO. INC., DEPT. 156, LIMA, OHIO, U. S. A.

PRODUCERS OF MAGNETIC SEPARATOR EQUIPMENT SINCE 1923

YOUR DUST MAY NOT BE VALUABLE...

But It's Certainly Costly!

Because dusts and fumes may not be valuable, *don't think for a minute that they're not costly!* Uncontrolled, they do more damage to plants, machines, and men than any other production factor. Corrosive action on plant equipment, abrasive wear on production machines, and lowered manpower efficiency cover only part of their damaging effects.

Dracco Dust Control Equipment, engineered *exactly* to your plant requirements, will effectively eliminate your dust and fume hazards by trapping them at each source. Before they can attack either men or machines they are carried away in a completely enclosed system to a centralized waste disposal unit.

With Dracco Dust Control, your plant will be cleaner and your workers more efficient. Repair and maintenance bills for both plant and equipment will be lower.

Why not investigate Dracco Dust Control methods and equipment for a cost-saving solution to your problem.

DRACCO CORPORATION

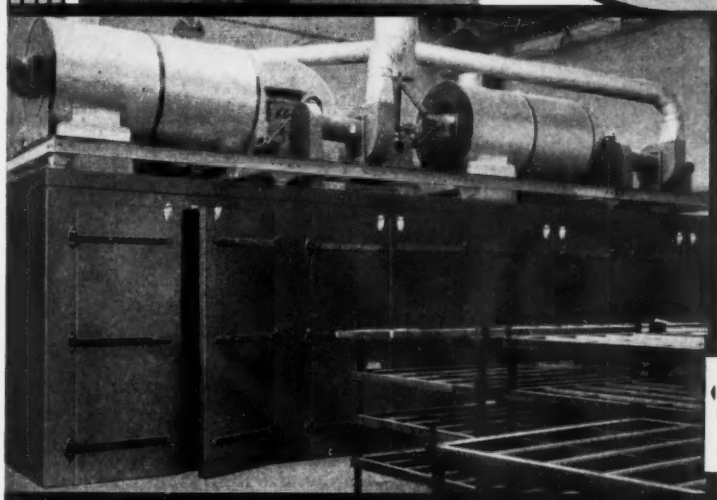
Harvard Avenue and East 116th St.
Cleveland 5, Ohio

Write today for the Dracco Engineering Data Sheet which will simplify an analysis of your specific problem. Address Dept. G-2, Cleveland, Ohio.

DRACCO *Performance Proved*

DUST CONTROL EQUIPMENT · PNEUMATIC CONVEYORS

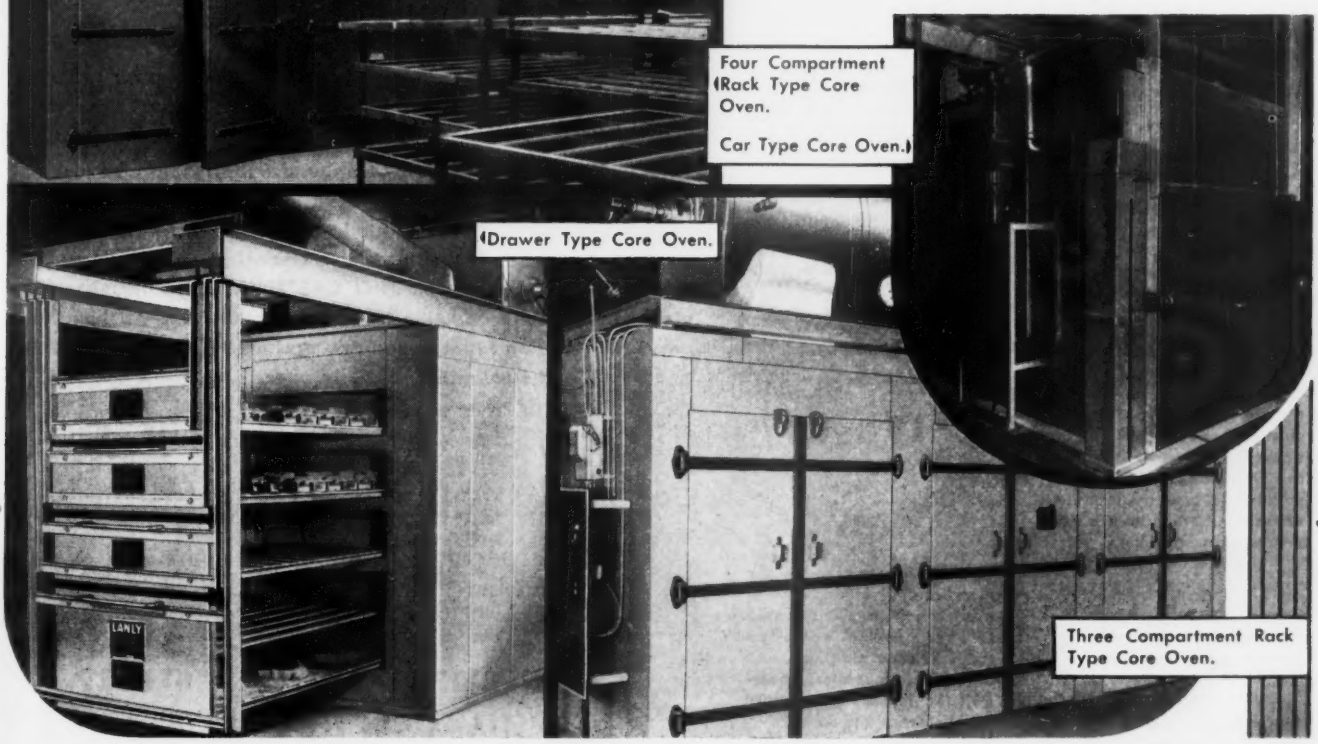
Two Compartment Car Type Mold Drying Oven.
Two Compartment Rack Type Core Oven.
Single Compartment Rack Type Core Oven.
LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO



The Lanly reputation has been established as the result of the consistent incorporation of advanced, efficient design and high grade construction into every Lanly installation.

Core baking, pasting and mold drying ovens as well as casting conditioning and heat-treating ovens are available in standard units.

Write for Literature and Complete Information.


Four Compartment Rack Type Core Oven.
Car Type Core Oven.
Drawer Type Core Oven.
LANLY
Three Compartment Rack Type Core Oven.

CASTFLUX — The 'National' DUAL-PURPOSE FLUX

TYPE SB-10

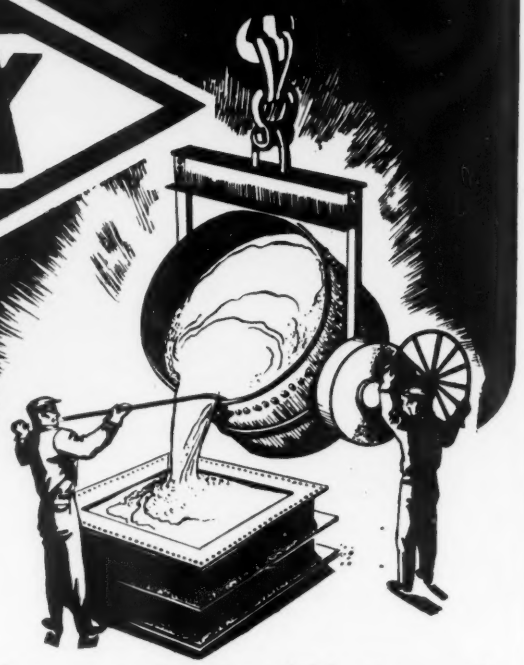
virtually produces

NO *Smoke*
NO *Fume*

it is partly **EXOTHERMIC · DEOXIDIZING · INSULATING**

CASTFLUX

Trade Mark Reg.



unconditionally
GUARANTEED

*unless CASTFLUX SB-10 meets with your full approval, material can be returned at no expense within 30 days.

on blind and open RISERS

CASTFLUX raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

as a 'HOT TOPPING'

CASTFLUX prevents oxidation by keeping the molten steel down into the main body of the ingot, greatly reducing the volume of piping and saving a substantial amount of metal. There is no carbon segregation or pick-up.

in the LADLE

CASTFLUX increases fluidity materially by cleansing and purifying the metal; bringing to the surface occluded oxides, gases, slag, dirt, and other foreign matter; offsetting the negative facters of inferior scrap and coke.

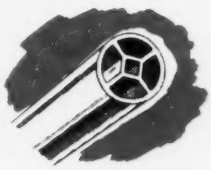
Place a trial order for
CASTFLUX SB-10
to prove these laboratory findings. You risk no money.*

. . . a nationally known, recognized research laboratory reports, "There is absolutely no carbon pick-up at the neck of the riser or casting when CASTFLUX SB-10 is used on steel and steel alloys." It is a partly exothermic compound, for feeding heads and risers, that virtually does not smoke or create fume. Its uniformity has been well established in the industry. As a LADLE addition it is a wonderful liquidizer—through its cleansing action it deoxidizes and de-gasifies the metal. That CASTFLUX SB-10 increases the yield, improves production at considerable savings has been proved by leading foundrymen and acclaimed by foundries, large and small, and steel mills the world over.

NATIONAL pigment co.

2115-2117 EAST YORK STREET
PHILADELPHIA 25, PA.

Independent Fabricators rely on

Kaiser Aluminum engineers for expert technical advice and engineering assistance on any aluminum casting or extrusion  problem. This service is immediately available to help you make better use of Kaiser Aluminum.

▶ Aluminum pig specification ingot, extrusion billets. Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Kaiser Aluminum

A major producer of aluminum pig, specification ingot and extrusion billets

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

High-Chromium, High-Carbon Iron

. . . the Iron That Hardens as it Wears

In many applications involving extreme abrasion, ordinary work-hardening alloys are not suitable. This is because most of these alloys require a definite pounding action for a martensite transformation, and the scouring action of an abrasive is not sufficient for development of high wear resistance. For this reason, high-chromium, high-carbon irons were developed — irons that wear-harden.

Chromium Content of Irons Ranges from 24 to 30 Per Cent

These irons are made in the electric furnace and have the following composition range:

Chromium	26 to 28 per cent
Carbon	2.60 to 2.80 per cent
Manganese	0.50 to 1.25 per cent
Silicon	0.25 to 0.75 per cent
Sulphur	max. 0.05 per cent
Phosphorus	max. 0.05 per cent
Nickel	minimum
Iron	balance

Irons of this composition are readily castable by steel casting techniques.

Development of Greater Wear Resistance by Heat Treatment

Structurally, these irons consist of primary iron-chromium carbides in a matrix of iron-chromium solid solution and secondary iron-chromium carbides. They are hard in the as-cast condition (500 to 550 Brinell), but when they are given an austenitization heat-treatment they develop much higher hardness (about 600 Brinell), and also have greatly improved wear resistance. Austenitization consists of heating these irons to a temperature of about 2012 deg. F. for an hour, then allowing them to cool in air. This heat-treatment promotes the formation of very unstable austenite—austenite that will transform to a harder martensitic end-product even under rubbing or mild impingement action. Austenitization has been found to be far more effective in increasing wear resistance than the promotion of unstable austenite by the addition of ferrite-forming alloying elements.

High-chromium, high-carbon irons can also be annealed to sufficiently low-hardness values for grinding or simple machining. Hardnesses as low as 350 to 450 Brinell can be obtained by heating the castings to temperatures of 1400 to 1450 deg. F. for 12 to 24 hours, then allowing them to cool in air.

Irons Have Wear Resistance Many Times That of Other Alloys

Austenitized high-chromium irons have been known to last as much as 21 times longer than other wear-resistant alloys in applications involving extreme frictional abrasion. These applications include sand-blast nozzles and liners, pantograph contact shoes, grinding disks, pulleys, chute-liner plates, dredge-pump liners, and rollers for crushing various hard materials.

In a recent test, high-chromium iron was compared to special wear-resistant steel castings as the material for hammers in a machine that was used to crush abrasive material. The chrome-iron hammers were found to have almost 7 times the wear resistance of the steel castings.

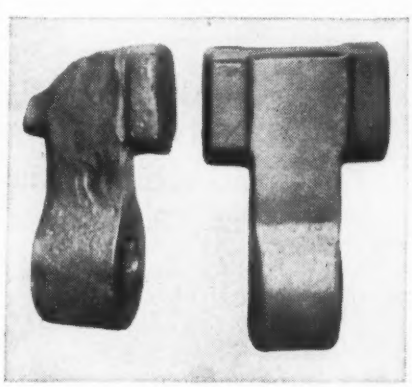


Fig. 1. After crushing the same amount of abrasive material in a hammer mill, the badly worn steel casting (left) had a weight loss of 37 per cent while the high-chromium iron casting (right) lost only 5.5 per cent.

Fig. 2. This chrome-iron pantograph shoe had a service life of about 10 years. A tool steel that was used in similar service wore out in about 3 or 4 months; copper lasted about 24 hours.

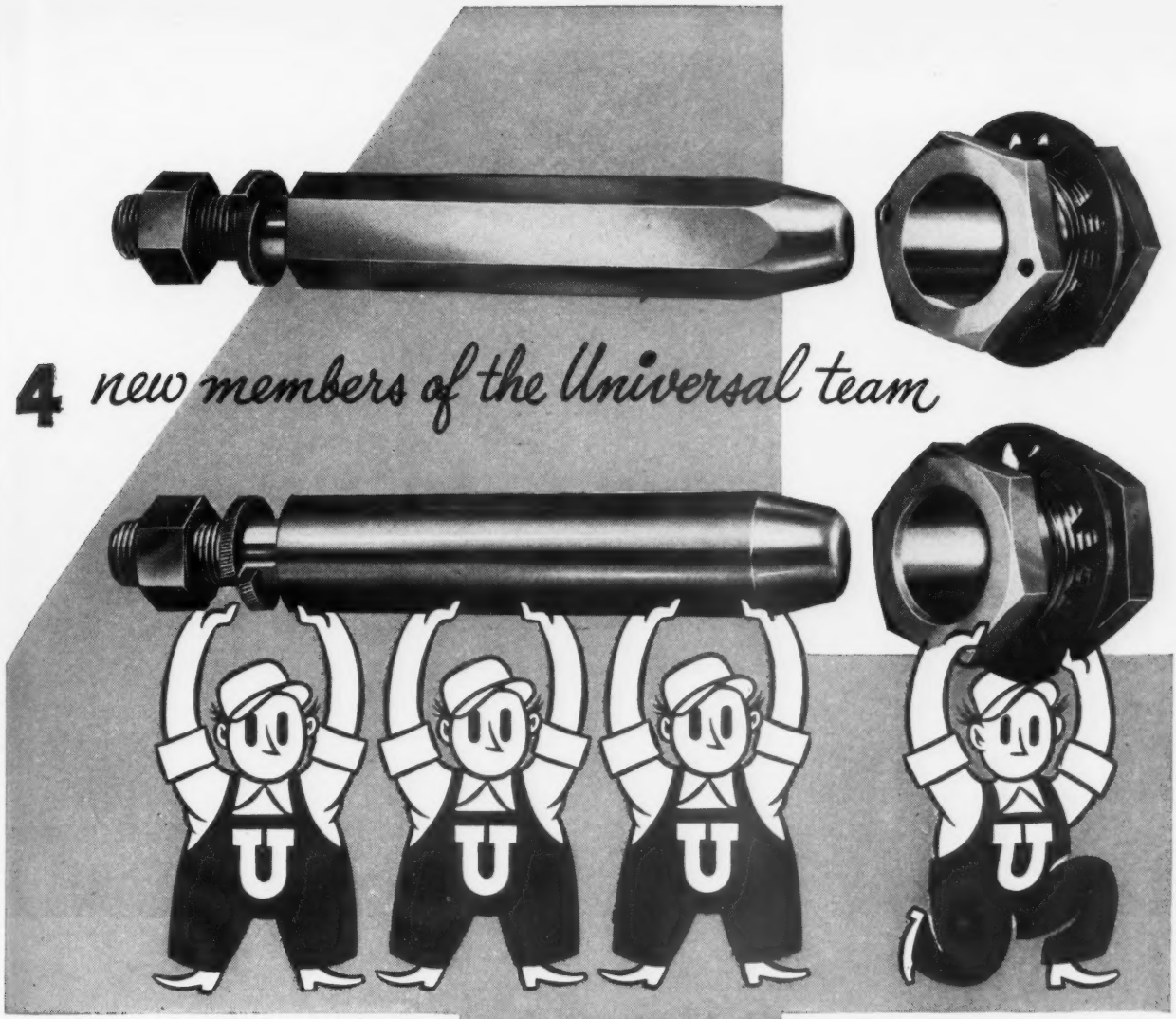
When thoroughly backed up with zinc, the iron also has enough shock resistance to be used effectively as crushing hammers and jaw plates for many severe rock-handling jobs.

Metallurgical Service Available

For years, ELECTROMET high-carbon ferrochrome has been used to make chromium additions to abrasion-resistant high-chromium irons. If you should have any questions about either the production or use of these irons, write to the nearest ELECTROMET office. Our metallurgists will be glad to give many valuable suggestions and recommendations on how to make or use this iron most effectively.

Write for a free copy of the ELECTROMET publication, "Abrasion-Resistant High-Chromium Iron." This booklet is a collection of some of the best available information on how to make and to use abrasion-resistant iron castings most efficiently.

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

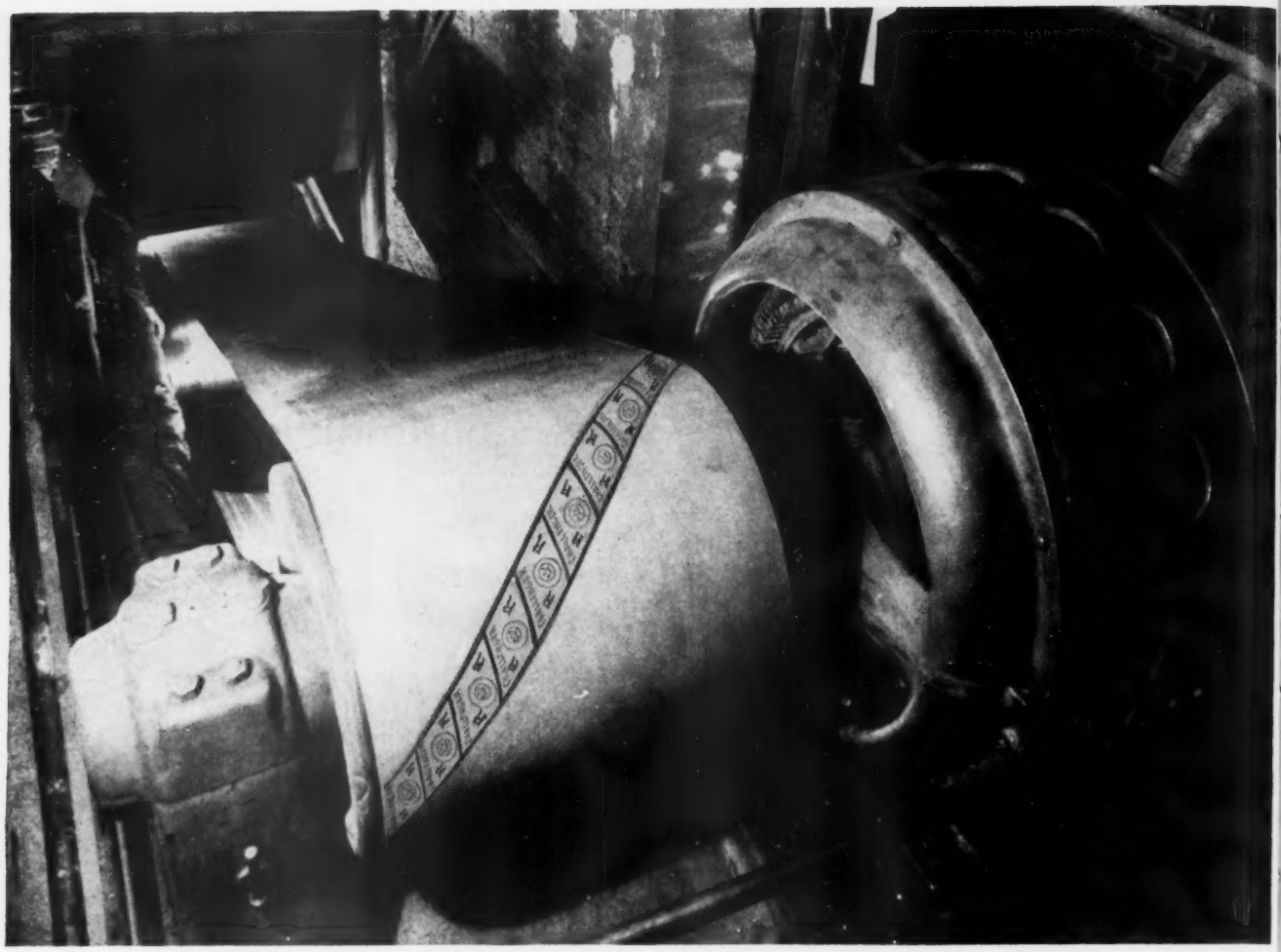


threaded flask pins and bushings now added to the UNIVERSAL quality line

To an already famous team of foundry equipment, Universal has now added a threaded series of Flask Pins and Bushings that will save you precious minutes by assuring instant and accurate alignment of cope and drag. Like other members of this famous team, they'll also save the cost and downtime that replacement always requires because they're heat-treated and precision ground from high quality steel to stand up under rough treatment. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. Direct your inquiries and orders to the office nearest you . . . 1060 Broad Street, Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

150

UNIVERSAL ENGINEERING COMPANY, FRANKENMUTH 4, MICHIGAN



for really efficient power transmission . . . it's Republic Rubber's *Challenger* Belting

No mistake about it. When it's a question of power delivery, the answer is Republic's Challenger Transmission Belting — the top performer of them all!

Challenger has been designed to handle your most difficult job. It's a flexible pre-stretched belt made of heavy, hard-woven, rubber-impregnated fabric for maximum service life. Challenger is an exceptional belt, being adaptable for long satisfactory service on heavy industrial drives subject to shocks and stresses, and also for drives operating at high speeds over small pulleys.

Challenger Belting is free from fastener trouble, and both top and bottom surfaces have special non-slip friction for better pulley traction. The edges are sealed against moisture, fumes and other deteriorating factors. Challenger is also fabricated with heat-resisting compounds for special operating conditions.

Standard plies and widths are available in roll lengths or tailor-made to specified endless lengths. Consult your nearby Republic Distributor today about your particular needs.

Remember, Republic Rubber has been *the* specialist in the mechanical rubber goods field for more than 48 years.

INDUSTRIAL RUBBER PRODUCTS BY

REPUBLIC RUBBER DIVISION

Lee Rubber & Tire Corporation

YOUNGSTOWN, OHIO

SCENE: Pouring molds in large foundry
EQUIPMENT: JEFFREY MOLD CONVEYORS
REASON: To speed up production, reduce costs
OTHER UNITS: Flask Fillers, Sand Conditioning and Handling Equipment
WHAT TO DO: Send for a JEFFREY Foundry Engineer

THE JEFFREY MANUFACTURING COMPANY
ESTABLISHED 1877
907 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2 Boston 16 Cincinnati 2 Detroit 13 Houston 2 New York 7 St. Louis 1
Beckley, W. Va. Buffalo 2 Cleveland 15 Forty Fort, Pa. Jacksonville 2 Philadelphia 3 Salt Lake City 1
Birmingham 3 Chicago 1 Denver 2 Harlan, Ky. Milwaukee 2 Pittsburgh 22

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain) Ltd., Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio

At Bruce Foundry & Mfg. Co., Tecumseh, Michigan, they use only Fremont Flasks and Jackets.

Use Them Once... and you'll never change

FREMONT MAGNESIUM SLIP FLASKS

Fremont Flasks and Jackets as used at Burt Foundry Co., Toledo, Ohio.

Fremont Flasks and Jackets in operation on the continuous pouring system at the completely mechanized foundry of The Ohio Brass Co., Mansfield, Ohio.

EASIER TO HANDLE

(Magnesium weighs 1/3 less than aluminum).

LONGER SERVICE

(Magnesium has twice the tensile strength of aluminum). Solid, bolted and welded corner construction.

MORE EXACTING WORK

Accurately machined inside surfaces and flanges. Steel faced top and bottom flanges. The one-inch GROOV-LOCK FOOLPROOF PIN, particularly adapted to cope or drag pattern jobs, guarantees perfect alignment indefinitely. (Other types of standard pin fittings available).

FREMONT CAST IRON OR CAST ALUMINUM JACKETS

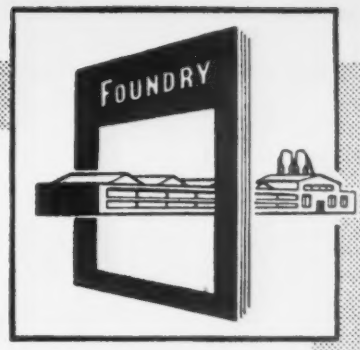
MORE ECONOMICAL

Precision machined and drilled, bolted corner construction permits easy insertion of new sides or ends. The entire jacket need not be scrapped. Standard style for ordinary foundry practice. Grooved style, which permits ready gas escape, for steel foundries.

Flasks and jackets can be assembled on 3°, 4° or 5° taper. Write today for literature.

The Fremont FLASK CO

FREMONT, OHIO



Dear Reader:

This page has been provided for your convenience. Use one of the return cards below for more information on advertisements in this issue of **FOUNDRY**.

Write the name of the advertiser and the page number of the ad in the spaces provided. Check the type of information you want. After you have finished going through this issue of FOUNDRY and have jotted down all of the ads on which you'd like more information, just tear out the card, drop it in the mail. We'll do the rest.

Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

FOUNDRY
Readers Service

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio
Readers' Service Dept.

Please send further information on the following advertisements in this issue:

PAGE NO.	NAME OF ADVERTISER	Send Technical Data	Send Price Information	Nearest Source of Supply
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.....	.....	○	○	○

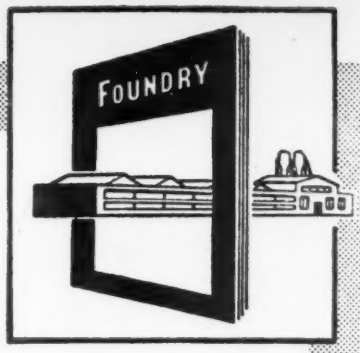
YOUR NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

FDY 2-52



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YOUR NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

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Penton Building
Cleveland 13, Ohio
Readers' Service Dept.

FOUNDRY
Readers Service

MECHANIZE MATERIALS HANDLING

WITHOUT COSTLY INSTALLATIONS OR LOSS OF PRODUCTIVE TIME

use an Allis-Chalmers HD-5G and Tracto-Shovel Attachments

You speed materials handling "right now" when you put this fast-working tractor-shovel combination on the job. The HD-5G starts boosting production without waiting for costly installations or changes in plant layout. Digs into the toughest jobs, indoors or out . . . lifts, loads, excavates, pushes, tows...handles all materials, bulk, solid or packaged.

And it works easily in close quarters — turns in its tracks . . . has no bulky, overhead structure. Outdoors, the track-type tractor is not bothered by weather or ground conditions . . . works the year around, even in unpaved yards.

Choice of thirteen interchangeable Tracto-Shovel attachments makes the HD-5G a one-tractor material handling fleet. Special buckets, lift fork, crane hook, rock fork, 'dozer blades and others may be interchanged in a few minutes with simple tools.

Write for descriptive literature on the full line of Tracto-Shovels from 1 to 4 cu. yd.

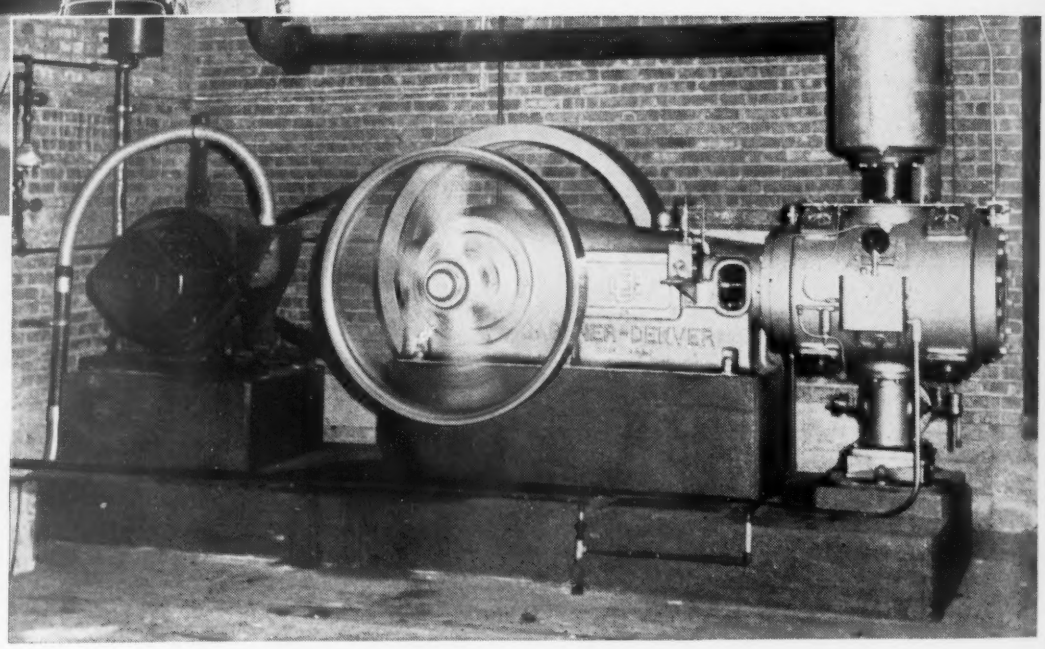
LIFT FORK ATTACHMENT
Stacking Height (under forks) - - 106 in.
Lifting Capacity - - - - - 4,000 lb.

CRANE HOOK
Lifting Height (hook to ground) - - 138 in.
Lifting Capacity - - - - 5,000 lb.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-5G THE MODERN TRACTOR IN EVERY WAY
Designed For Your Job • Built To Take It • Easy To Service
Easy To Operate
40.26 drawbar hp. • 1 cu. yd. bucket
Dumping height — 9 ft., ¼ in.

Unrestricted Flow—



Gardner-Denver RX Single-Stage Compressors are made in a wide range of sizes to assure the right pressure and capacity for your needs.

. . . another reason why GARDNER-DENVER RX compressors save you money!

Free and easy! That's the way air flows through the large, unrestricted valve and port areas in the Gardner-Denver RX Compressor. That means the RX uses less power to supply the compressed air you need—and there you have one of the big reasons why an RX costs less to operate.

Other money-saving RX features include the dust-tight, heavy-duty power end—automatic lubrication—and "Air-Cushioned" Duo-Plate valves. Write today for additional information.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

FERROCARBO Briquettes

by
CARBORUNDUM
TRADE MARK

Added to Cupola for
MORE EFFECTIVE Deoxidation

Easily added to the cupola charge, FERROCARBO silicon carbide Briquettes provide thorough deoxidation... produce super-heated iron of greater fluidity. Foundry variables are reduced. Cleaner, sharper castings are poured. Made from silicon carbide specially processed for metallurgical use.

Write or Phone our
FERROCARBO DISTRIBUTORS:

KERCHNER, MARSHALL & CO.
PITTSBURGH
Cleveland, Birmingham, Philadelphia and Buffalo

MILLER & COMPANY
CHICAGO
St. Louis and Cincinnati

FERROCARBO Briquettes are manufactured under U.S. Patents 2,119,521 and 2,497,745. The process of making cast iron through utilization of silicon carbide is registered under U.S. Patent 2,020,171.

Distributed in Canada by:
WILLIAMS & WILSON, TORONTO, Montreal and Windsor, and by KERCHNER, MARSHALL & CO., BUFFALO, N. Y.; and made and distributed in Canada by THE CANADIAN CARBORUNDUM COMPANY, LTD., NIAGARA FALLS, ONTARIO.

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N.Y.

HERE'S *Custom Tailoring* IN STEEL FLASKS

Different foundry systems require different styles of Flask construction — the same Flask will not properly serve all molding and handling conditions.

The Flask shown here is a good example of Shanafelt "custom tailoring" in Steel Flasks. The reinforcement is varied to suit the need — flanges are designed and placed only where needed, thereby saving unnecessary cost and weight.

If you want your Flasks made to fit your own special conditions, just tell us your requirements and our engineers will work out the construction details.

This special flange gives added strength, a wide bearing surface, and a smooth rolled edge.

The Shanafelt corrugation adds strength to the sidewalls.

This Flask gets no beating at the parting, so these flanges were kept light to hold down the weight of the Flask.

The way this Flask is handled, here is a hard service point. The heavy welded flange is extra wide to fit the conveyor.

special bumpers accurately placed

special stub pin with long head

special clamping lugs fit their standard clamp

special handles to make exact overall width to fit sling

The SHANAFELT *Manufacturing Co.*

ESTABLISHED 1893

2600-2700 WINFIELD WAY N. E. • CANTON, OHIO

Desand-degraphitize castings in 10 minutes with VIRGO® MOLTEN CLEANER

UNLOADING VIRGO-CLEANED CASTINGS from continuous cleaning line.

HERE ARE THE BENEFITS!

- **Longer machine tool life.**
- **All surface defects show up.**
- **A cleaner, better product.**

With Virgo Molten Cleaner your castings are completely free from sand and graphite before they are machined, giving you greater machine tool life. Any surface defects on castings are shown up, and you can scrap defective castings before they are machined. This same freedom from impurities insures trouble-free operation for your product when it is placed in use.

The process is simple and easy to operate—does not require close supervision. A five-minute immersion of castings in Virgo Molten Cleaner bath at 800° F. is usually enough to dissolve every trace of sand, and dissolve graphite to satisfactory depth. A water quench removes salt and leaves a protective coating on the castings. (This coating is corrosion-resistant and may be left on if castings are to be stored.) The coating is removed by a three-minute dip in dilute acid. A brief water hosing or rinse completes the job.

You can use the Virgo bath, at higher temperature, to stress relieve while desanding. By combining operations in this way, costly annealing equipment, as well as the additional operation can be eliminated.

For full details and description of this process, write us today. Please use your business letterhead or coupon below.

For Fast, Safe, Low-Cost DESCALING— VIRGO® DESCALING SALT

Producers and fabricators of stainless and alloy steels use Virgo Descaling Salt to quickly remove scale produced by hot rolling, forging, extruding, casting, annealing. The Hooker Process is backed by 15 years' experience in salt bath descaling and cleaning. Engineering, research and on-site operating assistance are part of our service.

SEND FOR THESE BULLETINS

They tell the whole story on Virgo Descaling Salt and Virgo Molten Cleaner—what they are, how they work, their advantages, equipment involved, and the Hooker services you enjoy as a user of the process.

HOOKER CHEMICALS ®

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

20 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y.
WILMINGTON, CALIF.
TACOMA, WASH.

1-1949

Hooker Electrochemical Company
20 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

Please send me Bulletins checked: Virgo Descaling Salt ☐ Virgo Molten Cleaner ☐

NAME _____

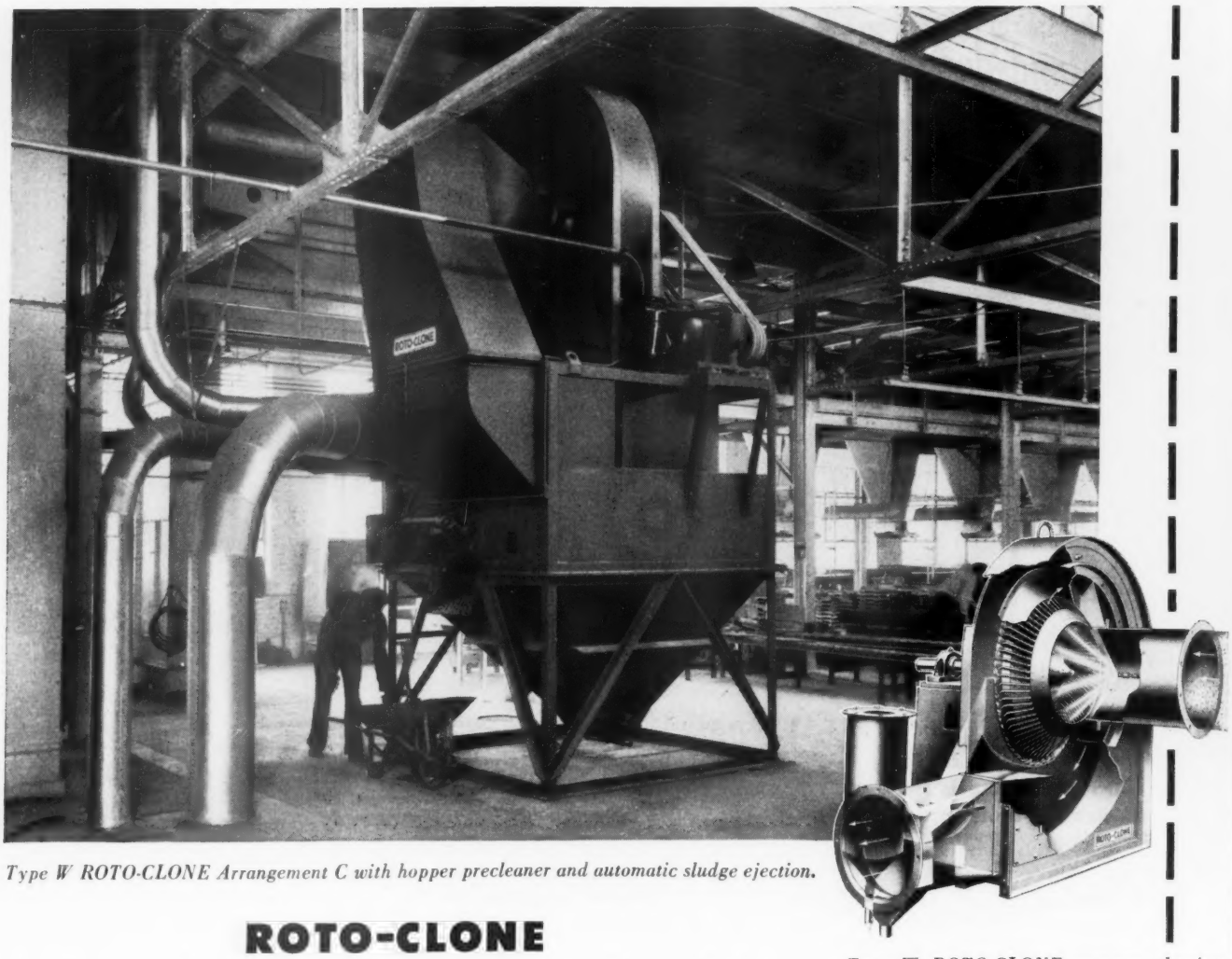
TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE ____

air as clean as you like it!



Type W ROTO-CLONE Arrangement C with hopper precleaner and automatic sludge ejection.

Type W ROTO-CLONE cutaway showing integral water sprays combined with dynamic precipitation for high efficiency collection over wide range of particle sizes.

ROTO-CLONE "cleans house" for modern foundries

Dust is a costly bi-product of stepped-up production schedules

It seriously complicates good housekeeping, while maintenance costs increase proportionately. However, "engineered dust control" with AAF ROTO-CLONES is solving this problem economically and efficiently in many modern foundries. These versatile dust collectors save space and maintenance costs by combining all three functions of exhausting, separating and storing dust in one compact, efficient unit.

The Type W ROTO-CLONE above is one of three types and ten installations, which "clean house" for a large brass foundry. It's capacity of 15,000 cfm. serves to exhaust both shake-out and sand system operations. As an example of ROTO-CLONE operating economy this Type W has had only one parts replacement in seven years of continuous operation. This was one set of chains for the flight conveyor used to eject collected material in sludge form into the wheelbarrow shown in the photograph.

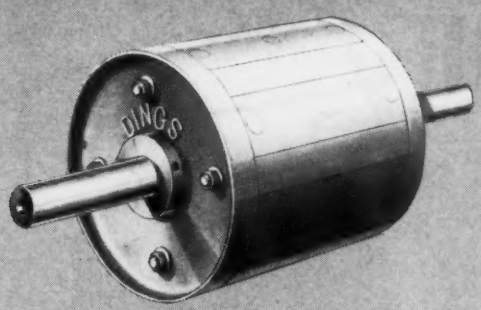
For better housekeeping at a substantial saving in operating and maintenance costs take a good look at ROTO-CLONE "engineered dust control". Call your nearby AAF representative today or write us for Engineering Bulletin No. 270A.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

American Air Filter
COMPANY, INC.

®AAF

266 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California



Dings Non-electric, Permanent Perma-Pulley.

Dings Extra Powerful Self Cleaning Rectangular.

1. 2. 3. 4.

Dings All-Welded Cooler Operating Lifting Magnet.

Dings "Holdtite" holds castings in position for swing grinding.

4 WAYS TO CUT HANDLING COSTS

Compare the advantages these Dings magnets offer over your present methods:

1. THE NON-ELECTRIC, PERMANENT PERMA-PULLEY in the sand handling system takes iron out automatically, without attention, without electricity, without maintenance. Perma-Pulleys have no operating expense, are guaranteed to be permanently magnetic. Magnetic strength is certified.

2. THE SELF CLEANING RECTANGULAR FOR THE TOUGHEST JOBS . . . *another sand handling cost-cutter.* Great power enables this magnet to handle particularly difficult iron extraction jobs. For *maximum* iron removal, none can surpass the Dings Rectangular. Self-cleaning feature makes operation automatic—eliminates "carry-over" of sand with iron.

3. LIFTING MAGNET LIFTS 10 TO 100% MORE. Ideal for handling scrap, pig iron, castings, metal flasks, etc. Lifts more because it's cooler operating. All welded, lightweight, moisture-proof, rugged, 4-point chain suspension.

4. "HOLD-TITE" CUTS GRINDING LABOR COSTS UP TO 25%. Firmly holds all shapes of castings up to 1000 lbs. in position for swing grinding. Magnet can be tilted to 7 different positions. Requires practically no maintenance, simple to install. SEND FOR THIS PAPER: *"Lowering Cleaning Room Costs Through Use of Magnetic Chucks"*. Use coupon below.

If you can use the advantages these magnets offer, NOW is the time to act. Deliveries are still better than average.

Dings

DINGS MAGNETIC SEPARATOR CO.
4708 W. Electric Ave., Milwaukee 46, Wisconsin

SEND THIS COUPON
OR DROP A POSTCARD

Dings: Send me Catalog containing full information on

☐ PERMA-PULLEY ☐ LIFTING MAGNET
☐ RECTANGULAR ☐ "HOLD-TITE" plus

Article on "Lowering cleaning room costs through the use of magnetic chucks"

NAME .....

COMPANY .....

ADDRESS .....

.....

.....

ANOTHER EXAMPLE OF

versatility

Approved by AGA

Listed by UL

DRAVO HEATERS HELP FEDERAL-MOGUL CORPORATION SOLVE A FOUNDRY VENTILATING PROBLEM

10 DRAVO *Counterflo* HEATERS . . .

- **Keep atmosphere healthy**
- **Equalize pressure**
- **Provide constant temperature**
- **Increase employee morale**
- **Improve efficiency**
- **Step up production**

At Federal-Mogul Corporation's non-ferrous foundry in Detroit, exhaust equipment removes 400,000 cu. ft. of contaminated air per minute to eliminate smoke, fumes, dust and excessive heat. During warm weather, make-up air comes from open windows and doors. But providing warm make-up air in winter was a difficult problem, for natural infiltration did not supply sufficient make-up air and what did enter chilled the working area.

Federal-Mogul solved this by installing 10 Dravo *Counterflo* Heaters at strategic locations in the foundry. Mounted horizontally or vertically, each heater, equipped with automatic modulating controls, produces 22,000 cu. ft. of even temperature air per minute. Heaters are shut down at night, but heat the building quickly next morning. In summer, the units are used for fresh air ventilating.

RESULTS: Normal atmospheric pressure maintained, facilitating exhausting of heavy gases; improved comfort; healthier working conditions; increased worker efficiency; improved morale, better production records!

VERSATILE DRAVO HEATERS ARE AT WORK IN MANY TYPES OF INDUSTRIAL AND COMMERCIAL APPLICATIONS

Dravo *Counterflo* Heaters are ideal for space heating and ventilating in warehouses . . . machine shops . . . railroad repair shops . . . process industries . . . stores . . . schools . . . churches . . . military installations.

DRAVO HEATERS OFFER YOU . . .

- **Low initial cost . . . users report 30% to 60% savings.**
- **Concentration of heat at working level.**
- **Low Fuel consumption . . . burn gas or oil . . . easily converted.**
- **Automatic Control . . . on-off or modulating controls.**
- **Long service life, low maintenance . . . stainless steel combustion chamber.**
- **Mobility . . . easily moved to any location.**
- **Flexibility . . . where floor space is limited, can be wall-hung or suspended from trusses.**

We will be glad to send you more information about heating and ventilating with Dravo *Counterflo* Heaters. Write today for Bulletin No. PQ-526

DRAVO CORPORATION

HEATING DEPARTMENT
Dravo Bldg., Fifth & Liberty Ave.
PITTSBURGH 22, PA.

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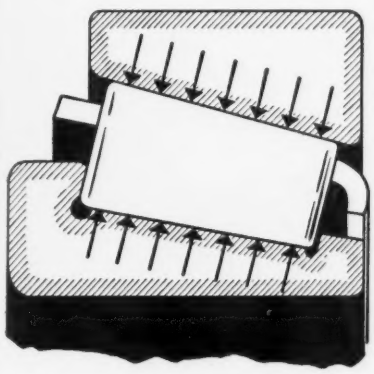
6 problems you can solve with TIMKEN® bearings

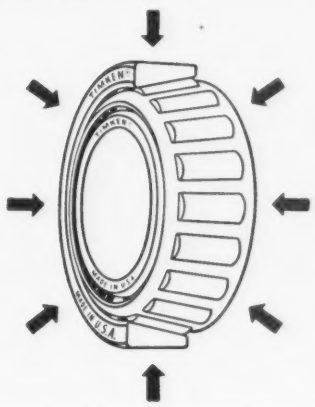
HEAVY LOADS

Loads carried on the rollers and races of Timken® bearings are spread evenly over a line of contact. The greater load area assures extra load-carrying capacity.



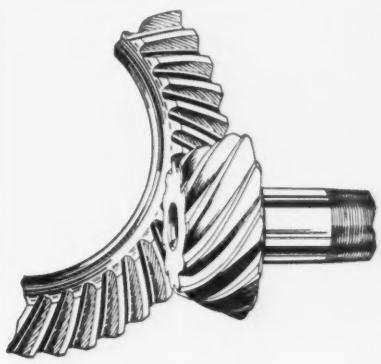
COMBINATION LOADS

Due to their tapered design, Timken bearings carry radial and thrust loads in any combination. No auxiliary thrust bearings or plates are needed.



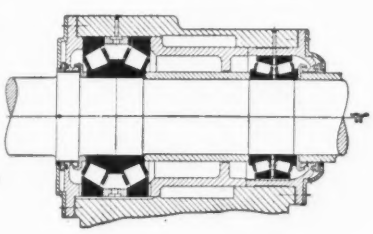
PRECISION

Timken bearings hold shafts in positive alignment, prevent end-movement, minimize deflection. Gears mesh precisely, assuring a smooth flow of power.



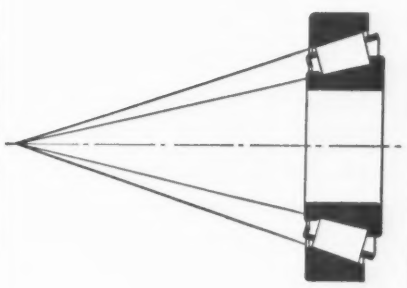
MAINTENANCE

Closures are more effective because Timken bearings keep housing and shaft concentric. Dirt and grit are kept out. Lubricants are kept in.



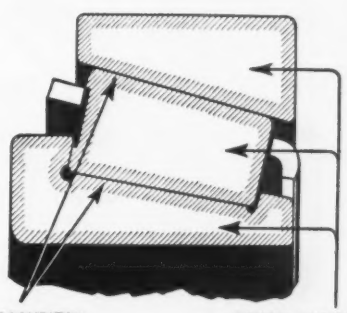
FRICTION

Timken bearings roll freely due to true rolling motion. Lines coincident with tapered surfaces of rollers and races meet at a common point on the bearing's axis.



WEAR

Rollers and races of Timken bearings are made of Timken fine alloy steel—case hardened for a hard, wear-resistant surface and tough, shock-resisting core.



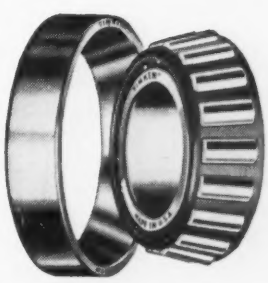
CARBURIZED, WEAR-RESISTANT SURFACE

TOUGH, SHOCK-RESISTING CORE

Be sure to specify Timken roller bearings for the machines you buy or build. Look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST ◎ LOADS OR ANY COMBINATION

Completely New and Proven Operating Principle

Custom built in any Length, Width or Depth

ADAMS ALUMINUM EASY-OFF FLASK

These advantages will cut your production costs!

RIGID CONSTRUCTION through proven corner design, permits reduced weight without the loss of maximum strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved superior to other forms of corner design.

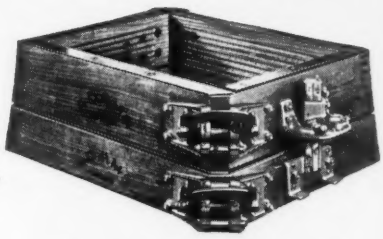
MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

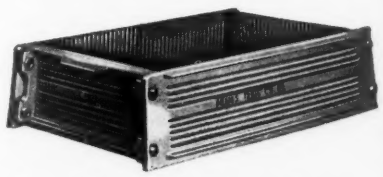
ADJUSTMENTS are made only when the mechanism is in locked position.

ALUMINUM PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Steel strips available upon request at no extra charge.

HANDLES AND TRUNNIONS are available when specified . . . at extra charge.



Adams Cherry Easy-Off Flask



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Adams Steel Jacket

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Cherry Snap Flasks—Cherry Slip Flasks—Aluminum Slip Flasks—Easy-Off Flasks
Cherry Presser Boards—Wood Bottom Boards—Steel Bottom Plates—Steel Jackets
Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

The ADAMS Company

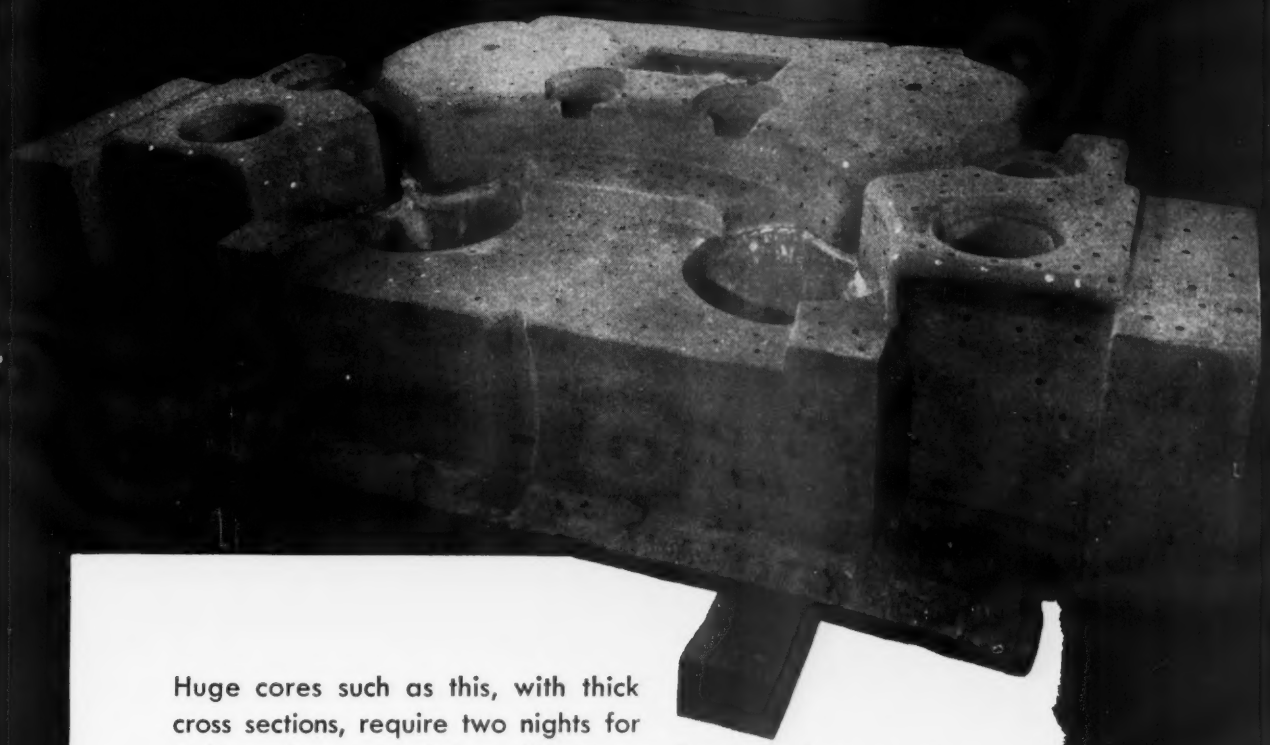
ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

DUBUQUE, IOWA, U.S.A.

Core Baking Time Halved

WITH TRULINE® BINDER IN THE MIX



Huge cores such as this, with thick cross sections, require two nights for baking when core oil is used in the mix. Even then, bottoms are sometimes green. By replacing oil with Truline Binder, cores bake faster and uniformly. The one shown here was thoroughly baked overnight!

Truline-bonded cores do a better and faster job all the way. They bake faster . . . increase productive capacity of ovens. They mean less gas at pouring time, thus sounder castings. They collapse easily, and shake out fast. Truline saves up to 50% in cleaning time, and castings come out cleaner . . . require less finishing.

If you are trying to meet accelerated production demands, especially with existing equipment and manpower, it will pay you to send for technical data on Truline Binder. Our foundry service men will be happy to work with you.

NF52-1

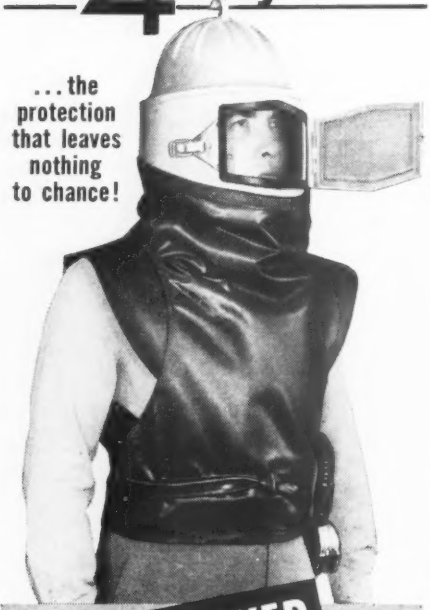
HERCULES POWDER COMPANY INCORPORATED Naval Stores Dept., 920 King St., Wilmington, Del.

the helmet that's

Danger Proofed

4 Ways!

...the protection that leaves nothing to chance!



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SAND BLAST HELMET

FATIGUE-PROOF COMFORT! Made of extra tough duralumin to defy shock and abrasion—yet so light it insures wearing comfort hour after hour!

DUST-PROOF SEAL! New inner collar! New style cape! Harmful abrasives can't seep in! Special flexible wire ring clamps cape and inner collar snugly to helmet to seal dust out.

SHATTER-PROOF WINDOW! Larger, full vision window is made of dual shatter-proof abrasive resistant plastic — doubly protected by fine mesh guard! Controlled air distribution prevents fogging.

NEW BUMP-PROOF FLOW CONTROL VALVE! Can be set to any pressure — can't be jarred out of position. Assures positive pressure regulation; mounts conveniently to side of belt.

U. S. BUREAU OF MINES APPROVAL - 1927

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Manufacturers & Distributors of Industrial Safety Equipment

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Reader's COMMENT

Aluminum Grindings Outlets

TO THE EDITORS:

In FOUNDRY for November, 1951, page 117, you published an item from one of your readers—"Wants To Dispose of Grindings." Could you give us the name of this party as we are interested in securing grindings, sawings and dust of aluminum.

I. W. WILENCHIK
Metallurgical Products Co.
35th and Moore Sts.
Philadelphia 45

●

TO THE EDITORS:

In your November, 1951 issue under the "Questions and Answers" section you have an inquiry concerning the disposal of aluminum alloy grindings, sawings and dust. We may be able to use such material and would appreciate the origin of the inquiry.

THOMAS HAND
Corhart Refractories Co.
1600 *West Lee St.*
Louisville 10

●

TO THE EDITORS:

In reference to the question concerning aluminum alloy grindings and sawings, as it appears on page 117 of the November, 1951 issue of FOUNDRY, we wish to inform you that we are actively engaged in the purchase of such materials at all times.

ALBERT KERZNER
New Jersey Metals Co.
712 *Rockefeller St.*
Elizabeth 2, *N. J.*

* * *

Seeks American Connection

TO THE EDITORS:

As a young engineer, but with production experience, I would like to widen my professional practice by working in the United States. My father is German and my mother French. I was born in France but went with my parents to Czechoslovakia. After the war I was a "fugitive from the German East Zone" and therefore homeless. My parents came under Russian rule and I have had no news from them in years.

Finishing my studies in Berlin, I was active as an engineer in various important German enterprises. Then as a homeless displaced person I went to France and two years later to Spain. Up to the present time I have specialized in the foundry industry and work independently. My specialty is industrial furnace building; foundry machines of all types; mechanization, construction, modernization of foundries; management as well as development and installation of complete foundry plants.

I also am familiar with the new German iron reduction method, "Stuerzelberg-Krus." At present I am directing the construction of such a plant, the first of this type, in a steelworks in Spain.

I hope you may get me in touch with some interested foundry or foundry equipment company.

Unfortunately, my knowledge of English speech at present is poor and therefore I am writing you in German. I have better knowledge of Spanish and French.

RALF RAYL-RADIER
Engineer
Apartado 1133
Bilboa, Spain

* * *

Kind Words from India

TO THE EDITORS:

There is usually a scramble for FOUNDRY in our office as soon as it arrives here, nearly a month after the date of its issue. More often than not I will be there at the head of the scramble, and get away with the book. FOUNDRY is one of the very few journals which interest me greatly.

Long live FOUNDRY! Your publication as well as our department.

M. V. DEVASTHLI
G. G. Dandekar Machine Works Ltd.
Bhiwndi (Bombay)
India

* * *

Wants Foundry Glossary

TO THE EDITORS:

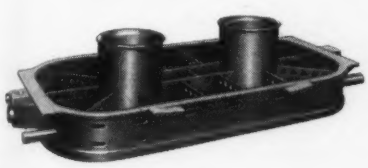
Awaiting with eagerness my copy of your excellent magazine FOUNDRY, I was very pleased when about a week ago I received the October issue. On a first glance through I noticed tucked away on the bottom of page 298 reference to a "Glossary of Foundry Terms" and I would be much obliged if you would send me a copy of same.

I take this opportunity of congratu-

(*Concluded on page* 82)

Industrial gives you your choice of Shapes and Sections

Round Wheel Flask with Pouring Lips



Twin Stack Converter Housing Roll-Off Flask

The right flask on the right job at the right price, will help you produce castings at a profit.

Expanded facilities permit quick deliveries

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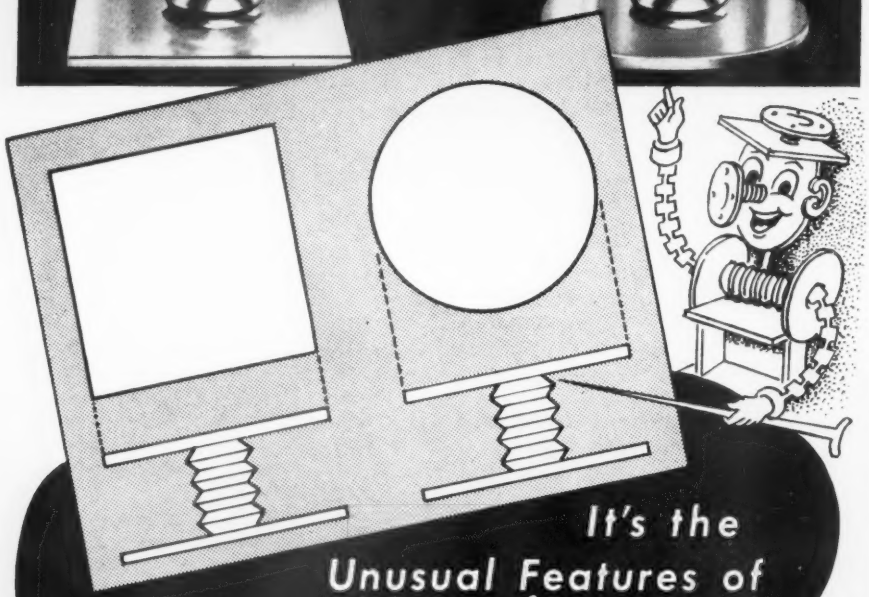


It's the
Unusual Features of
Milwaukee
CHAPLETS
that Insure Instant Fusing
in any Casting

It's the sharply cut "thread stem" design that insures instant fusing. Metal melts at the edges first, that's why the sharp edges "burn in" quickly and completely to insure instant fusing which results in freedom from leakers. As the fusing cycle slows up through the base of the thread and into the stem itself, there is ample time for adequate and proper core support. Here is a design where fusion takes place at exactly the right speed to give you both instant fusion plus proper core support.

Write for Samples and Prices

Milwaukee Chaplet & Mfg. Co.
1025 SOUTH 40th STREET • MILWAUKEE 4, WISCONSIN

(Concluded from page 80)

lating you on such a fine magazine, and although there are two other foundry journals coming into our country from overseas, they do not compare for interest value with FOUNDRY apart from relative prices. Apart from the interesting articles which appear each month, I find quite a real interest in your advertisers, and from some of whom I have received some very informative material.

I am a patternmaker employed by Westinghouse Brake Pty. Asia, who have an association with Westinghouse Air Brake Co. Wilmerding, Pa.

S. G. MORRIS
7 Richards Ave.
Eastwood, N.S.W.
Australia

•

TO THE EDITORS:

May we ask you to be so kind to send us a copy of your 32-page "Glossary of Foundry Terms" as mentioned in your magazine's copy of November, 1951.

We fancy ourselves with a workable knowledge of technical English. Nevertheless, we are more often puzzled reading American trade papers and also your most valuable publication by typically American words which we find hard to translate into French or even sometimes into the King's English.

We take gladly this opportunity to thank you for the excellence of your editorial papers and the accuracy of the trade news in your magazine which is read with much profit by all members of our staff.

ETABLISSEMENTS SIM S. A.
Morges, Switzerland

•

TO THE EDITORS:

As for "Yankee Words" I now and then experience the same trouble as the gentleman of Chile on page 82 in your November issue to hand today, and would, therefore, much esteem if you would kindly send me a copy of your "Glossary of Foundry Terms" booklet.

ERNEST MATTSSON
Kungstradgardsgatan 6
Stockholm, Sweden

* * *

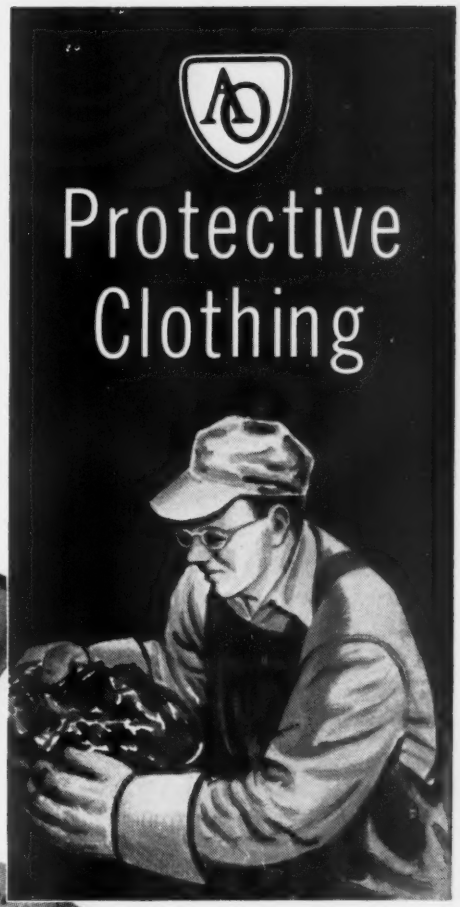
Helps Quality Control Work

TO THE EDITOR:

We appreciate your excellent coverage of our Quality Control Panel at the Gray Iron Founders' annual meeting. This article will help considerably in our quality control program.

H. W. STUART, Chairman
Quality Control Committee
Gray Iron Founders' Society
United States Pipe & Foundry Co.
Burlington, N. J.

AO Steel-Stapled **HAND PROTECTION** — Materials Handling Equipment for the HARDEST SERVICE!



AO makes a complete line of steel staple-reinforced, chrome-tanned cowhide gloves, mittens and hand pads. All are made to withstand hard wear on the roughest jobs yet remain flexible and comfortable. Your nearest AO Safety Product Representative can supply you with these BIG VALUES in protection and serviceability.

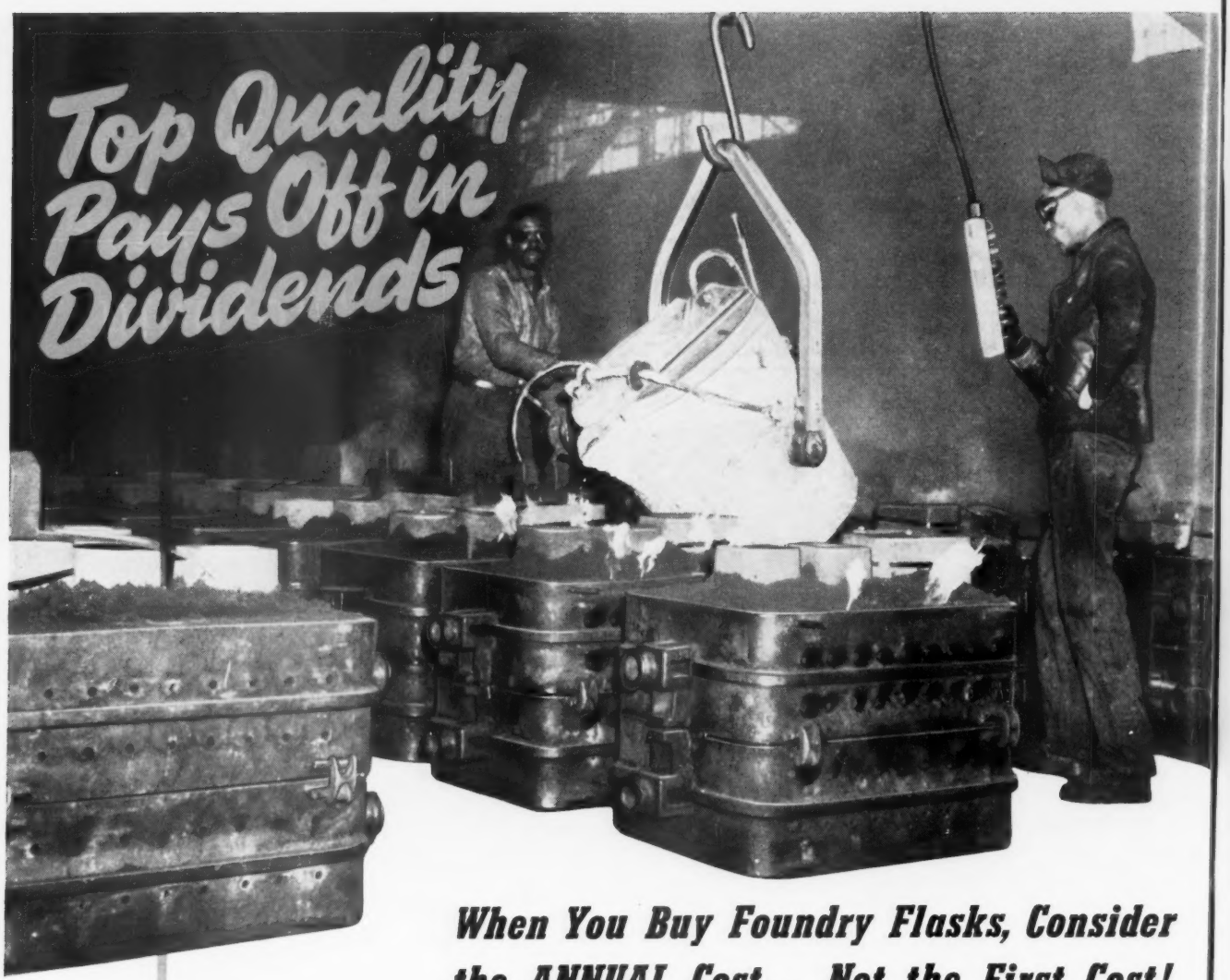
RECOMMENDED USES:

- **AO 1644 GLOVE** — For heavy operations in foundries and steel mills, heavy casting, handling of rough scrap.
- **AO 1655 GLOVE** — For grinding and rough operations.
- **AO 1660 GLOVE** — For foundry work and grinding.
- **AO 5X138 GLOVE** — For use in steel mills on flying shears, handling rough scrap, etc.
- **AO 5X264 GLOVE** — For handling small castings, rough stock and similar.
- **AO 1674 MITTEN** — Reversible, may be worn on either hand. For handling steel sheet stock, scrap, wheel castings, rough material.
- **AO 1201 HAND PAD** — For steel scrap and rough steel.

AO's Industrial Vision Program increases *production,* decreases *accidents. Write today for free booklet "Improved Industrial Vision."*

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

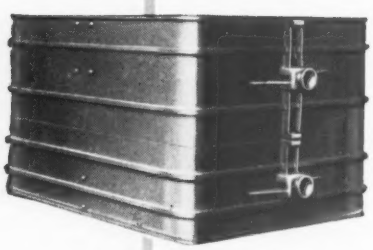


When You Buy Foundry Flasks, Consider the ANNUAL Cost... Not the First Cost!

You want to cut your casting production costs to rock bottom. You can do it with Sterling Steel Flasks. The famous ROLLED STEEL CHANNEL construction gives Sterling Flasks strength and rigidity to withstand tremendous pressures, year after year. You can treat them rough and they still retain their accuracy.

Consider such exclusive Sterling features as all-welded rolled steel . . . sturdy, reinforcing ribs . . . square flanges . . . full-width bearing. They insure a longer service life and greatly reduce the ANNUAL cost of flasks.

Actually, the so-called cheap flasks may be costly in the long run. So play safe. Buy Sterling Steel Flasks. They last longer . . . produce better castings . . . cost less per year. You'll find that top quality pays off in dividends.



Style 3/8 ND-RT Cope
Style 3/8 NS-RT Drag
Heavy Duty Flask.

Style 3/8 ND-RTX Cope
Style 3/8 NS-RT Drag
with Heavy Duty Clamps.

STERLING WHEELBARROW COMPANY
MILWAUKEE 14, WISCONSIN, U.S.A.

Sterling

Pioneers in the Manufacture of Foundry Flasks

A 6027-1PC

The Same Mistake?

TRENDS in the demand for castings during the last few months indicate a gradual approach to conditions which prevailed with a number of foundries immediately after our entry into World War II. Early in 1942, elimination of civilian production in many lines using metals, including the manufacture of automobiles, brought about the closing of a number of foundries. For example, many captive and independent production shops making automotive castings in gray iron and malleable iron were not suitable for conversion to the production of machine tool or armor castings, then in heavy demand, and were forced to discontinue these particular operations. Of course, their skilled foundry workers found employment elsewhere and many were lost permanently to the industry.

A year later, government procurement agencies encountered a snag in securing castings for the large numbers of trucks and other military vehicles required for the invasion of Europe and similar operations. While the modern automotive foundries still were available, it was not possible to rehire adequate manpower to return these plants to operation. This occurred at a time when the manpower supply for the entire foundry industry was at a low ebb, and government experts were engaged in the abortive effort to increase the supply through appeals to patriotism.

Eventually the foundry industry licked the problem of producing these vital castings, but the time required was much longer than would have been necessary with proper government planning. Meanwhile, some sections of the industry took an uncalled-for lambasting from government. Many will recall the speech of the colonel at the St. Louis AFS convention in 1943 criticizing the malleable industry and this phase of the war effort. While these criticisms were softened later by Ordnance, the industry had been embarrassed needlessly.

Although the present situation does not approach the all-out effort ten years ago, trends indicate government agencies are not looking toward possible future needs for components as orders are issued shackling operations of segments of the foundry industry. If operations of such specialty foundries are reduced to the point where future military requirements cannot be met, rest assured that government again will try to shift the blame to industry. If you don't believe that government still is capable of pointing an accusing finger, consider the recent criticisms of cast armor producers by the Ordnance representatives, when practically all of the blame for delay in the tank program rests with various military or defense agencies.

Government should try to anticipate future needs before issuing orders that put segments of industry out of business. Let's not make the same mistake again.

Frank G. Steinbach

Editor

Problems in gating, feeding and chill application are more easily solved when the metal solidification process is understood. Studies at the Naval Research Laboratory, disclosing valuable additional information on this subject, are described here, including for the first time the concept of solidification Thickness—Time—Transformation Mode (TTT) curves for various metals

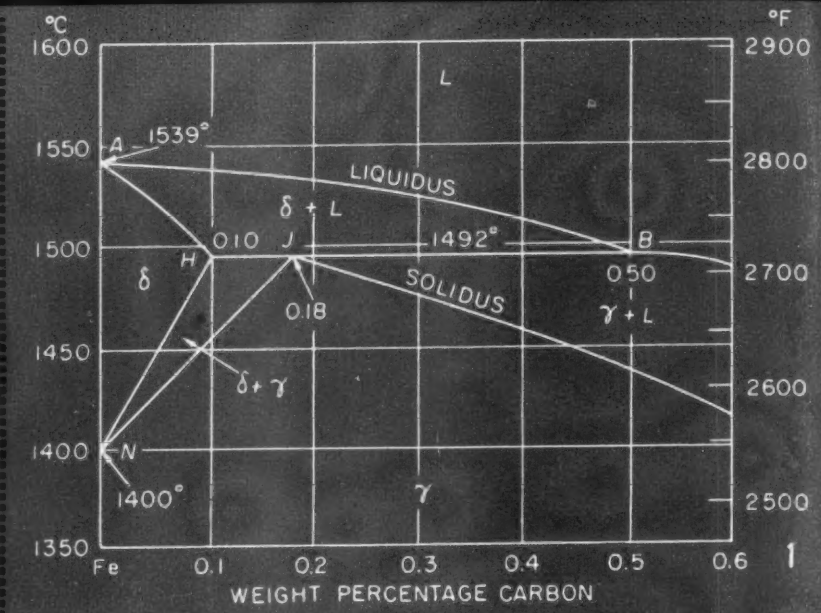


Fig. 1—Iron-carbon constitution diagram

SOLIDIFICATION OF METALS

By H. F. BISHOP
Metallurgist
and W. S. PELLINI
Head
Metal Processing Branch, Metallurgy Division
Naval Research Laboratory, Washington

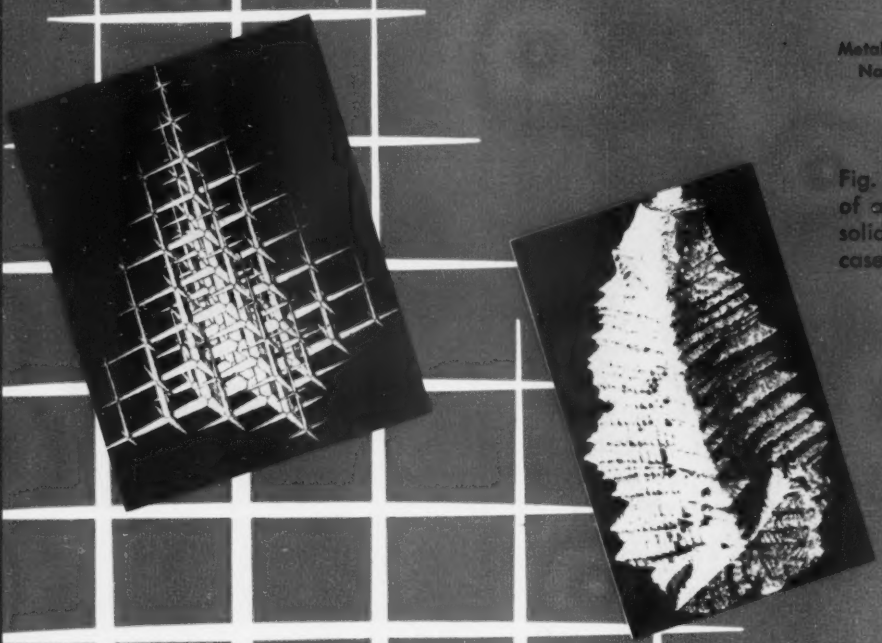
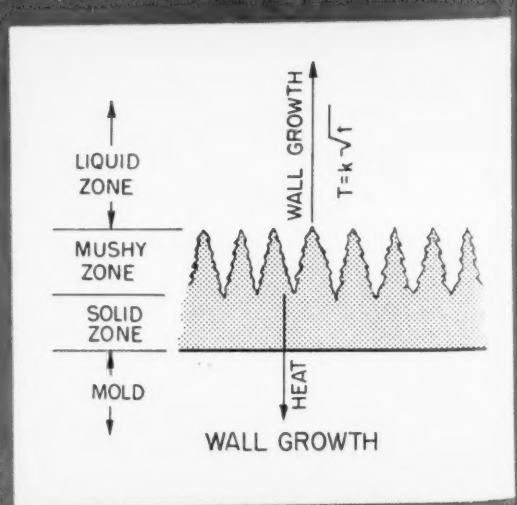


Fig. 2—Various aspects of solidification. Left: Growth of a dendrite from liquid. Below: Simplest case of solidification—wall growth. Below right: Practical case of solidification—interacting wall growth

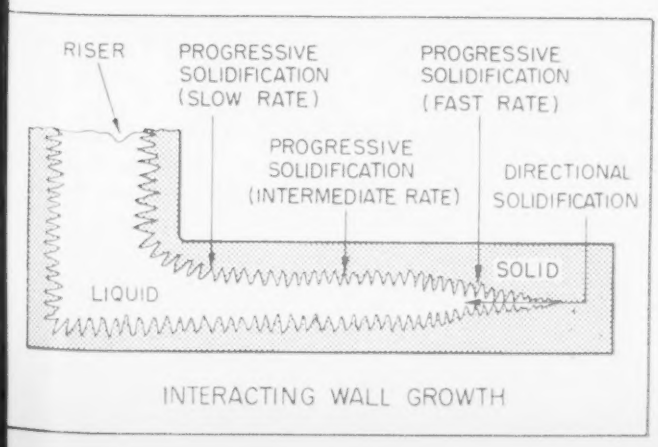


FOUNDRY technology has reached a stage of development at which there is a pressing need for exact quantitative information on the important factors which determine the quality of castings. Perhaps the most basic field of knowledge requiring review and expansion is that of solidification, since most of the available information is very general and qualitative. A better understanding of the solidification process would permit the operating foundryman to approach such everyday problems as gating, feeding and chill application more directly and to make more efficient use of the variables at his control.

Valuable additional information concerning solidification has been obtained recently at the Naval Research Laboratory by application of laboratory methods which have been used sparingly in past foundry investigations. Basically, this has been accomplished by the extensive application of instrumentation for the purpose of replacing visual observation with the unprejudiced and exacting observations of instruments.

This report is aimed at summarizing recent information regarding the mode of solidification of important commercial metals. Discussions of basic factors which determine the specific mode of solidification and practical applications to the problem of feeding to soundness also are included. Detailed descriptions relating to techniques and methods have been omitted in the interest of brevity. This information may be obtained by reference to an integrated series of publications recorded in the transactions of the AFS.[1, 2, 3, 4]

Basic Aspects of Solidification — The most basic aspect of solidification is provided by constitution diagrams which relate the physical state of a given alloy or metal to temperature. These diagrams show that alloys do not freeze at a fixed temperature but over a range of temperatures. Fig. 1, for example, which is a portion of the iron-carbon constitution diagram, shows that a steel containing .30 per cent carbon starts to solidify when its temperature falls below the liquidus line at 2760°F and completes its freezing when it has cooled below the solidus line at 2670°F. At temperatures between the liquidus and solidus the metal is a mixture of both liquid and solid and by application of the lever arm principle it is possible to determine the relative amounts of each phase present at any particular temperature.



The constitution diagram is not in itself sufficient to define the mode solidification which a given alloy will follow upon casting; another important factor—the temperature distribution (thermal gradients) which exists in the casting must be considered. These two factors, considered together, fully define the extent and nature of solidification which exists at any given time following pouring of the casting. It is important to recognize that the thermal gradient conditions are, to a certain extent, subject to control, and that by means of such control the mode of solidification of a given metal can be varied to suit specific foundry needs.

The process by which the conditions of solidification are deduced by dual consideration of the constitution diagram and temperature gradients is known as thermal analysis. This process has been applied by the authors to both fundamental and practical investigations—once understood it can serve as a powerful tool for foundry development and product improvement. A general understanding of the physical features of dendrite formation and growth is essential for proper utilization of the thermal analysis process.

The micro-features of solidification are exemplified by the formation of dendrite skeletons such as shown schematically at left in Fig. 2. On a micro-scale solidification progresses by the thickening of the trunks and branches of the dendrite skeleton; an actual dendrite in a late growth stage is shown in Fig. 2. The growth of dendrite colonies from a mold wall exemplify the simplest case of solidification on a macro-scale as represented by the schematic diagram of Fig. 2 (center), showing numerous dendrites growing into liquid metal. Since heat flows from the metal to the mold, the coldest metal is at the interface and the surface is the first region of the casting to develop solid material. Thus, the growth of solid from the mold surface to the interior is of a gradual or "progressive" nature.

During the progressive solidification of an alloy from a mold wall there may exist: (1) a completely liquid zone, (2) a mushy zone which consists of solid dendrites with liquid metal at the dendrite interstices, and (3) a completely solid zone. Depending upon the type of alloy, the mold material and stage of solidification, at least two and often three of these zones

TABLE I—Mold Materials and Alloys*

	MOLD MATERIAL	
	Chill	Sand
Sp. ht. cal/cc/°C	1.15	.42
Conductivity (CGS)	.070	.0036

	METAL					
	Aluminum	Bronze	Iron	Steel (.08C)	Steel (.25C)	Steel (.60C)
Conductivity (CGS) (solid)	.411	.278	.070	.076	.076	.076
Latent heat cal/cc	250.	320.	385.	525.	525.	525.
Sp. ht. cal/cc/°C	.675	.9	1.15	1.24	1.24	1.24
Solidus temp. °F	1200	1600	2090	2760	2700	2575
Liq.-sol. range °F	10	250	200	40	75	125

* Constants obtained from Ruddle[6]

TABLE II—Solidification Comparison

	Aluminum	Bronze	Iron	Steel (.08C)	Steel (.25C)	Steel (.60C)
Solidification time (sand)	50	75.	106	42	45	48
Solidification time (chill)	3.6	4.1		10	10	10
Ratio s.t. sand/s.t. chill	14	18		4.2	4.5	4.8

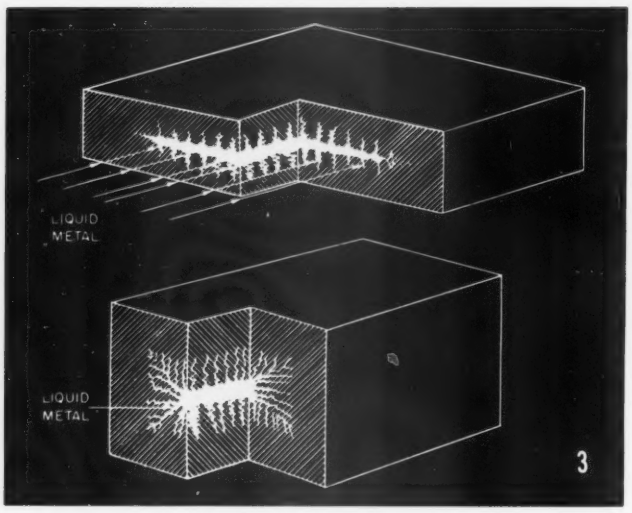


Fig. 3—Feed metal flow in plate and bar castings

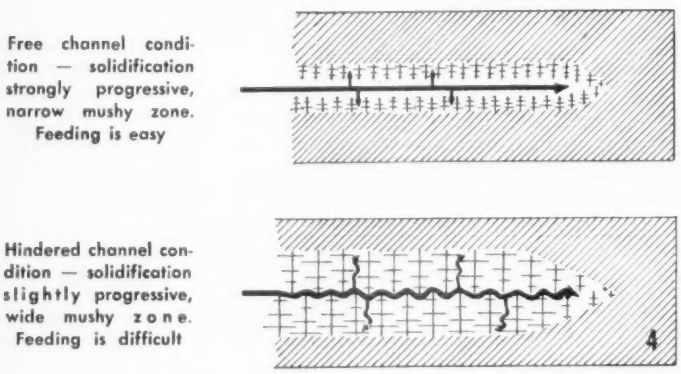

Free channel condition — solidification strongly progressive, narrow mushy zone. Feeding is easy
Hindered channel condition — solidification slightly progressive, wide mushy zone. Feeding is difficult
4

Fig. 4—Effect of progressive solidification on channel conditions for feed metal flow

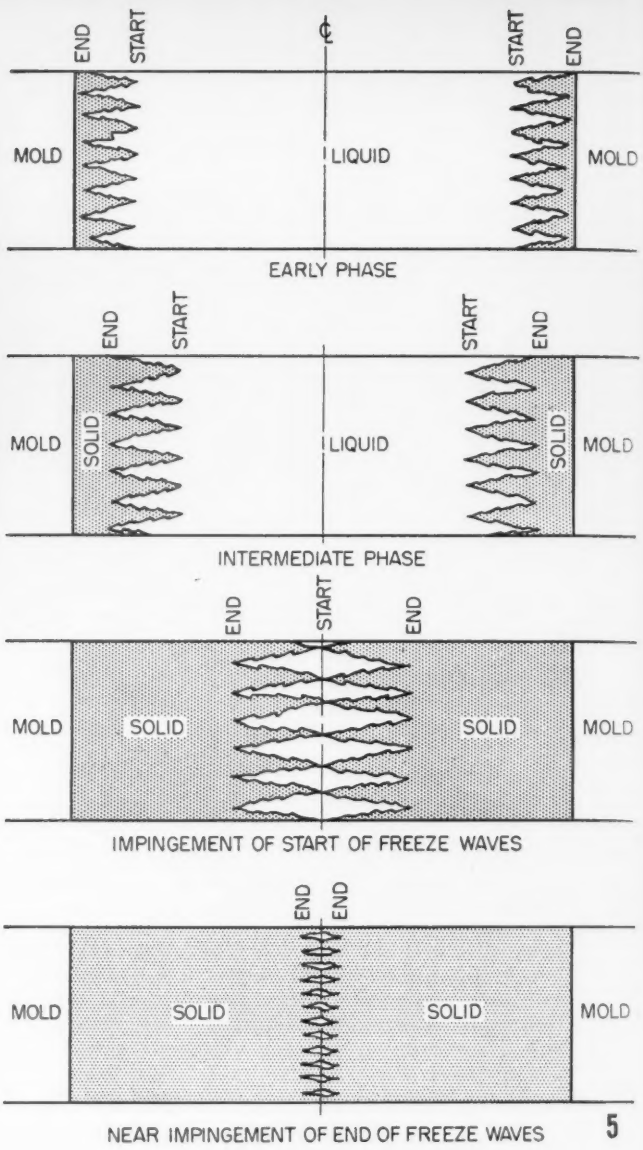


Fig. 5—Mechanism of lateral wall growth by progression of start and end of freeze waves

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exist concurrently. The classical formula indicating that the thickness of solid wall T is proportional to the square root of the elapsed time t ($T = k\sqrt{t}$) applies only to the period of unrestricted wall growth into free liquid. Once the fully liquid zone is eliminated the formula is no longer applicable.

The nature of the development and location of the mushy regions in a casting are most important to ultimate soundness as is indicated by the schematic drawing in Fig. 2 (right) of a practical case of solidification featuring differential and interacting wall growth resulting from the presence of corners and riser. Near external corners the greater volume of sand available to remove heat from the metal causes solidification to proceed at a relatively fast rate. Near internal corners the ratio of sand to metal is low and solidification from these locations proceeds at a relatively slow rate. Risers, because of their large heat capacity and the fact that they usually form re-entrant angles with the casting, cause solidification rates in adjacent sections to be relatively slow.

These effects of accelerated and retarded rates of *progressive* solidification reach into the casting for increasingly greater distances as wall growth progresses[1, 4] and cause solidification to be *directional* from the casting extremity toward the riser. If the cast section is sufficiently short to permit joining of the end and riser effects before freezing ends, a tapered longitudinal liquid channel extends over the entire casting, but in longer sections where end and riser gradients cannot join, the central portion of the section solidifies uniformly by heat loss through only the top and bottom mold faces. In such a region solidification is not directional and shrinkage results. It should be recognized that feed metal from the riser must not only flow longitudinally along the casting, but also laterally through narrow, tortuous interden-

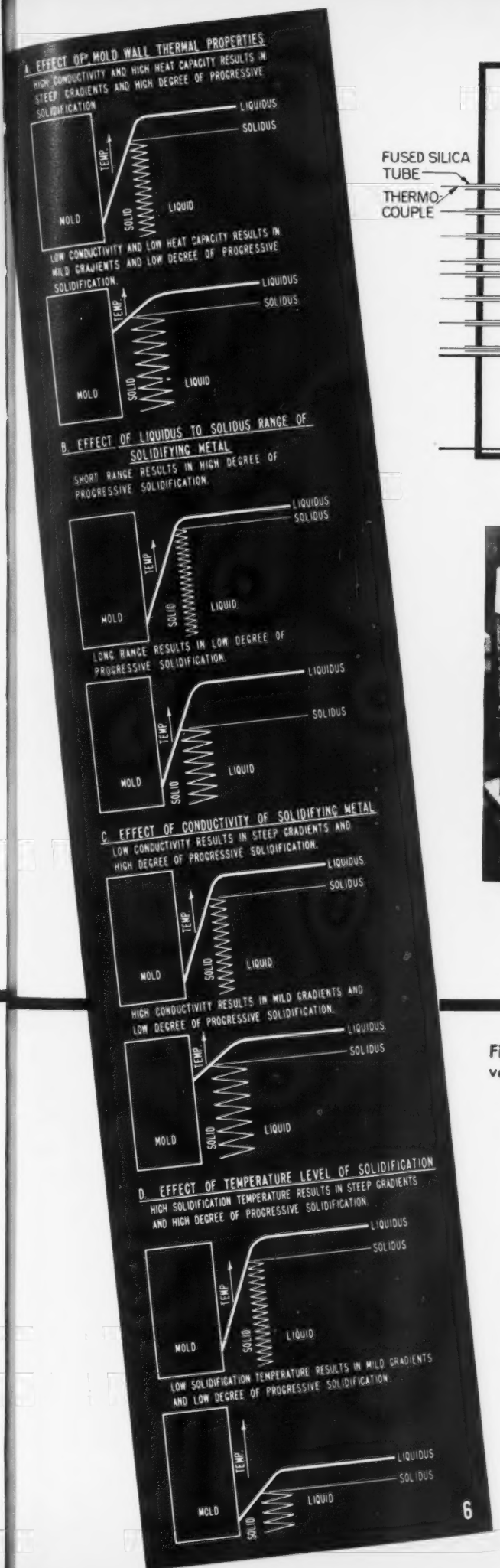
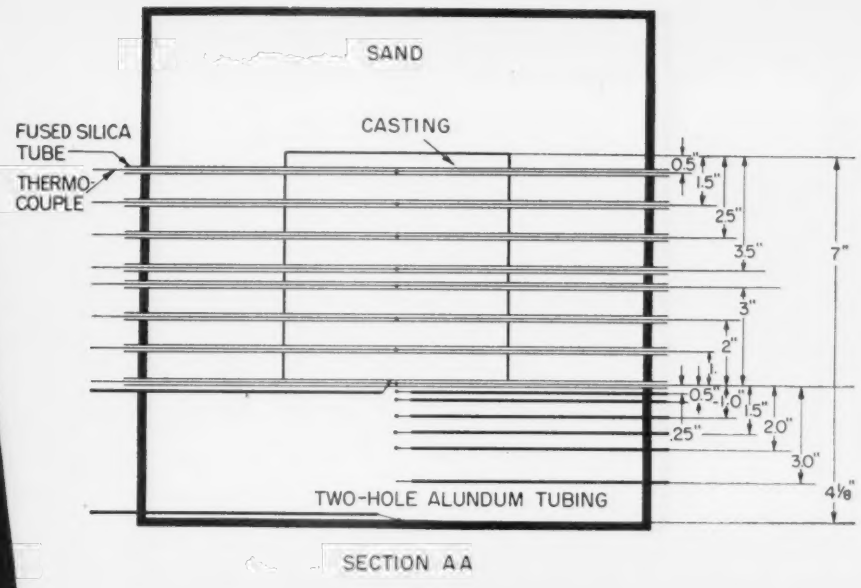

A. EFFECT OF MOLD WALL THERMAL PROPERTIES
HIGH CONDUCTIVITY AND HIGH HEAT CAPACITY RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION
LIQUIDUS
SOLIDUS
TEMP
MOLD
SOLID
LIQUID
LOW CONDUCTIVITY AND LOW HEAT CAPACITY RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
B. EFFECT OF LIQUIDUS TO SOLIDUS RANGE OF SOLIDIFYING METAL
SHORT RANGE RESULTS IN HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
LONG RANGE RESULTS IN LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
C. EFFECT OF CONDUCTIVITY OF SOLIDIFYING METAL
LOW CONDUCTIVITY RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
HIGH CONDUCTIVITY RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
D. EFFECT OF TEMPERATURE LEVEL OF SOLIDIFICATION
HIGH SOLIDIFICATION TEMPERATURE RESULTS IN STEEP GRADIENTS AND HIGH DEGREE OF PROGRESSIVE SOLIDIFICATION.
LOW SOLIDIFICATION TEMPERATURE RESULTS IN MILD GRADIENTS AND LOW DEGREE OF PROGRESSIVE SOLIDIFICATION.
6

Fig. 6—Effects of mold and metal variables on progressive solidification



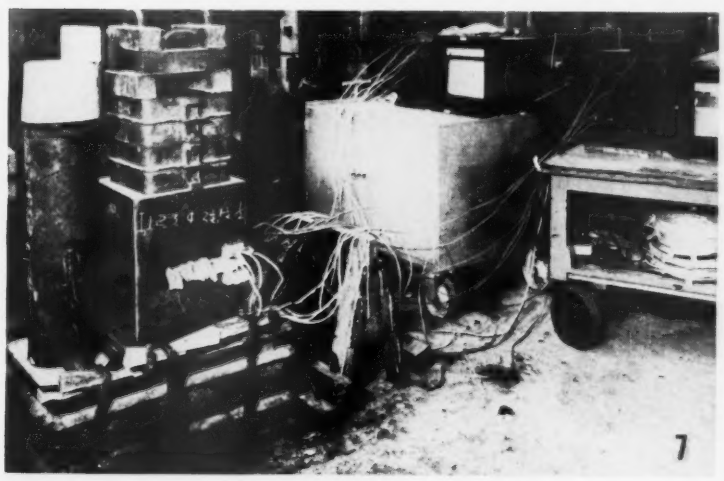
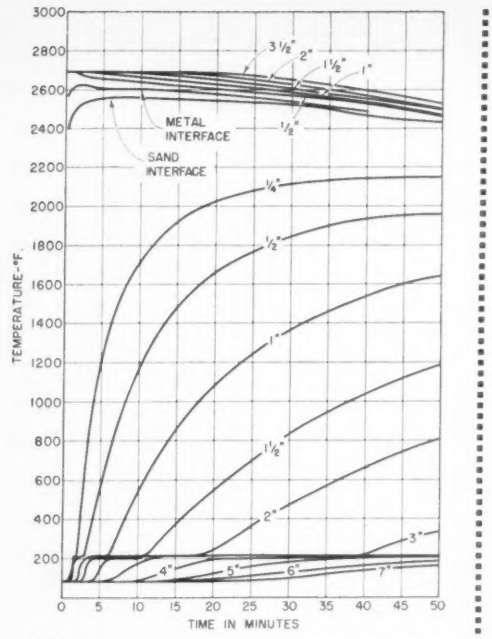


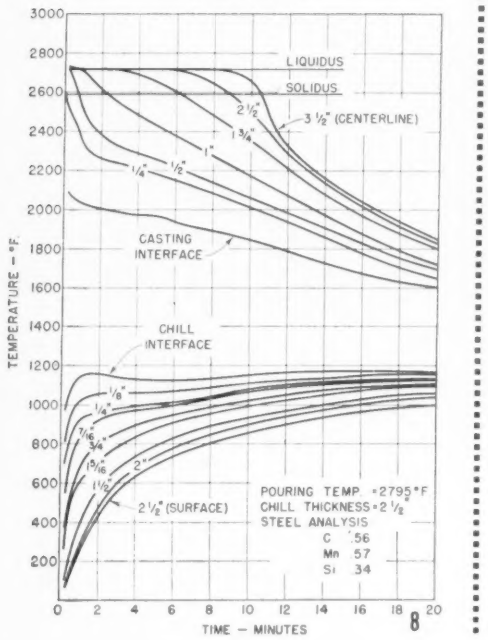
Fig. 7—Test assembly. Sketch at top shows location of thermocouples in casting and sand mold

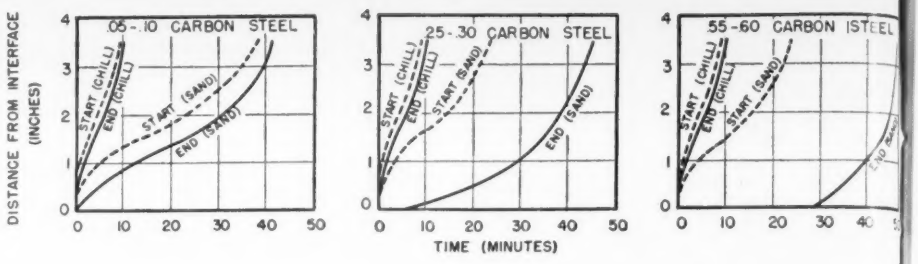
dritic channels which offer considerable flow resistance. The features of lateral feed metal flow in bars and plates is shown schematically in Fig. 3.

The relative difficulty of both lateral and longitudinal feeding depends on the width of intermixed solid and liquid zone. Fig. 4 illustrates that both types of feeding are considerably more difficult when lateral solidification is not highly progressive and a wide mushy zone is developed. It is thus evident that feeding to soundness is related not only to the degree of longitudinal or directional solidification occasioned by casting edge and riser effects but also to the degree of lateral or progressive solidification. An understanding of the factors which determine the degree of progressiveness of lateral solidification is of paramount importance to the problem of producing sound castings.

Wave-like Aspects of Progressive Solidification—







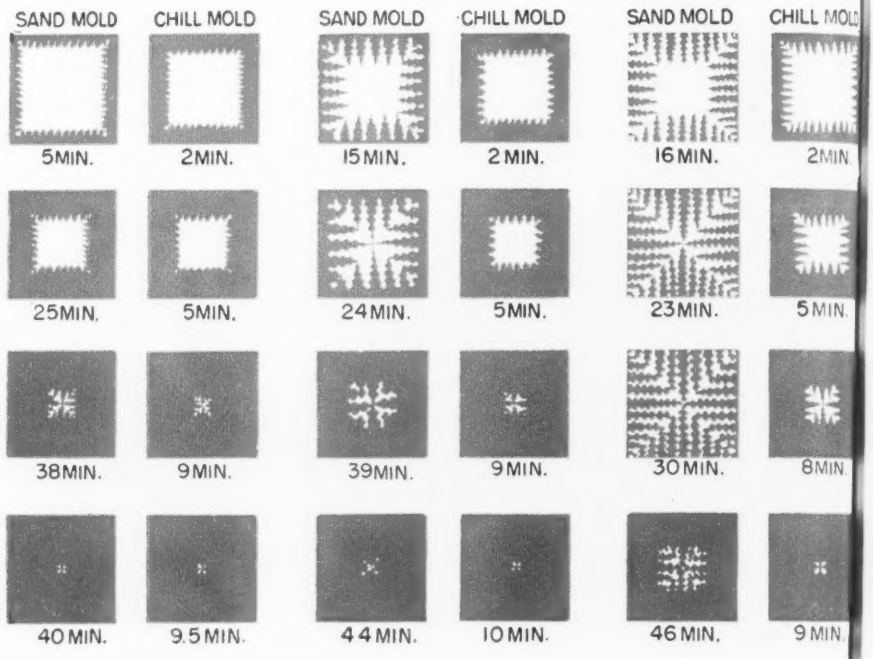
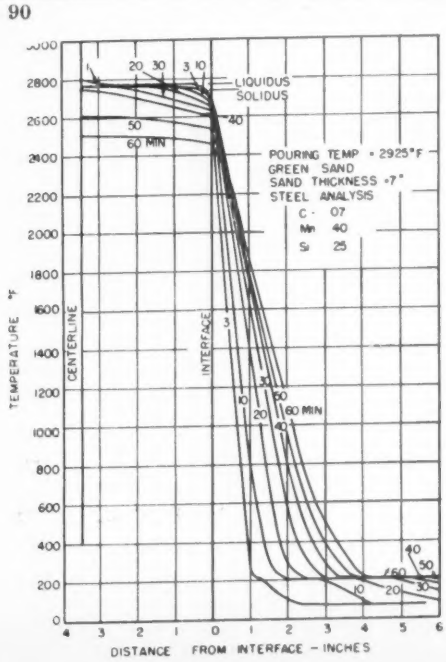
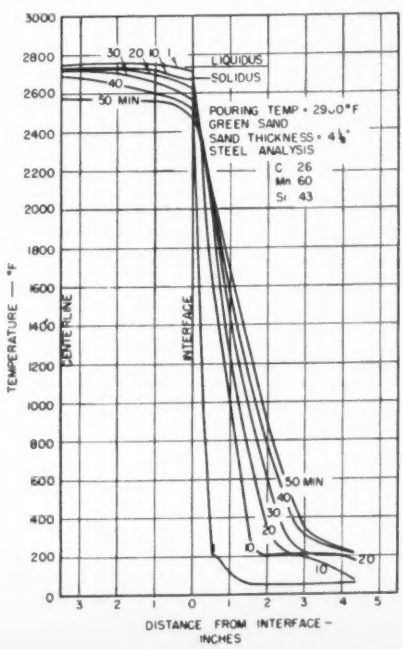
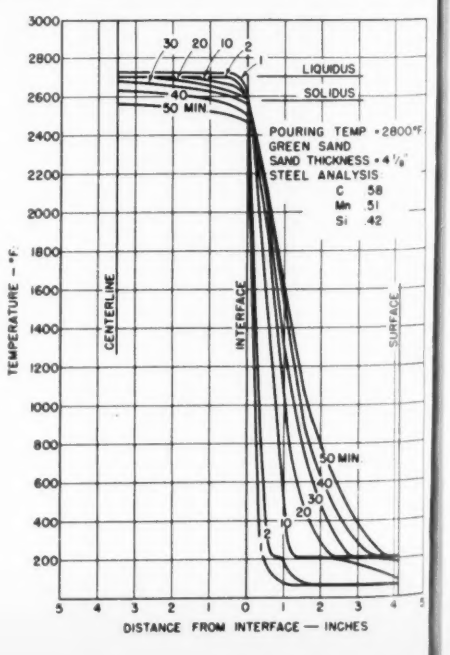


Fig. 8 (left)—Thermal cycles at various locations in castings and molds. Sand casting above, chill casting below. Fig. 9 (above)—Effect of carbon content on the solidification of steel in sand and chill molds expressed as (top) TTT solidification curves and (bottom) as graphic representations. Fig. 10 (below)—Thermal gradients in steel castings and molds







SOLIDIFICATION

Lateral wall growth may be visualized as occurring by the travel of two waves—the "start of freeze" and "end of freeze" waves—from the mold-metal interface to the casting center line. The "start of freeze" wave travels with the tips of the growing dendrites into free liquid and indicates the beginning of solidification. The "end of freeze" wave travels with the base of the growing dendrites where the last remaining liquid solidifies. The space separation between the two waves consists of intermixed liquid and solid metal and is the zone where actual solidification occurs.

Fig. 5 illustrates various steps in the progression of the two waves over the cross section of a casting. In the *early phase* of solidification the "start of freeze" wave has progressed into the casting for an appreciable distance and the "end of freeze" wave has barely started its traverse. At an *intermediate phase* of solidification, both waves have traveled farther into the liquid and there is a definite layer of completely solid skin at the surface. The two waves continue to advance until "start of freeze" waves complete the traverse and the dendrites from opposite faces impinge, thus eliminating the completely liquid zone. The "end of freeze" waves continue until the center line of the casting is reached, at which time solidification is complete.

It must be recognized that while the transverse solidification waves move toward the casting center line the liquid-to-solid transformation results in volumetric contraction. Thus if complete soundness is to be obtained there must be a simultaneous longitudinal flow of liquid from the riser to replace the volumetric contraction losses.

The rates of travel of the "start" and "end of freeze" waves and their space separation within the casting vary with the mold materials and the type of

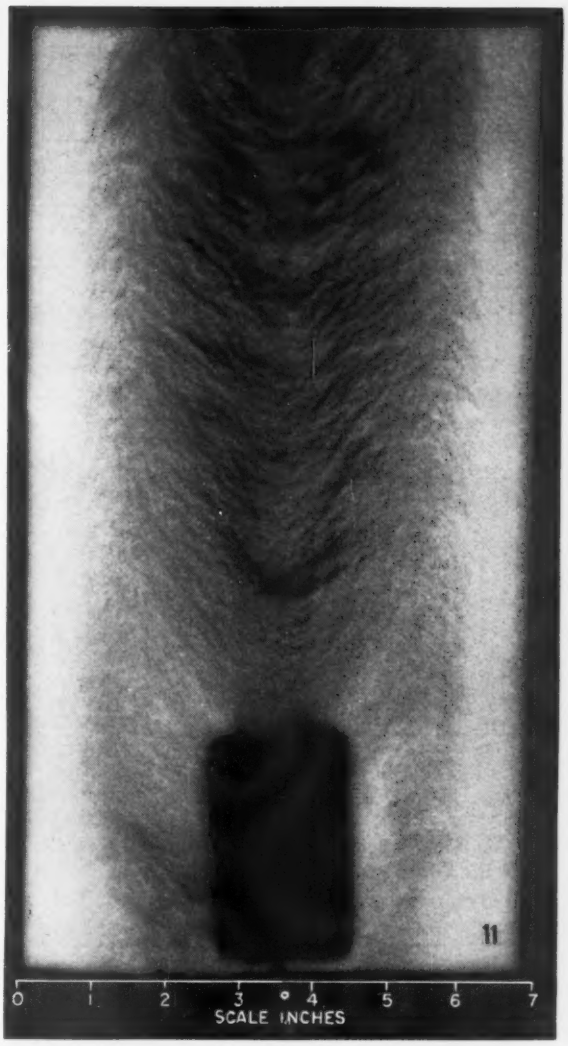
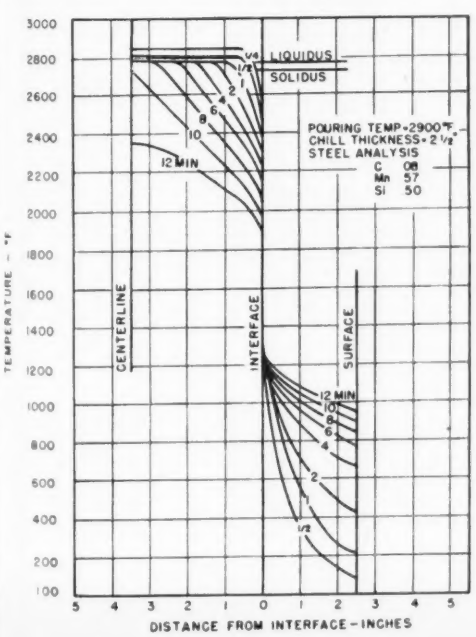
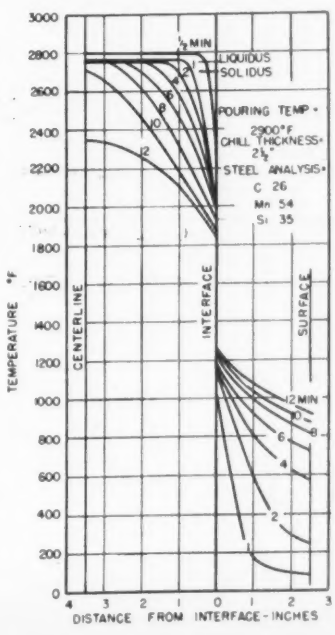
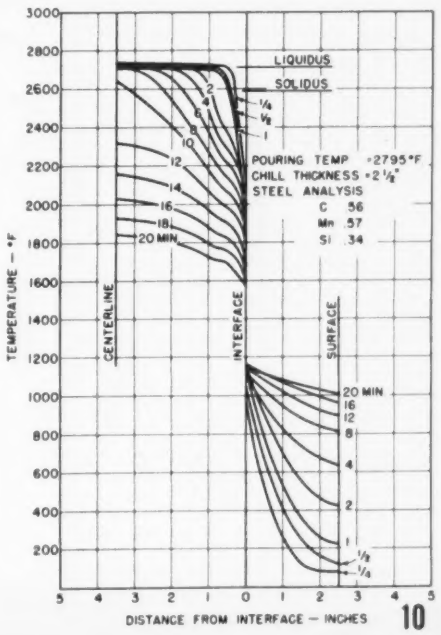
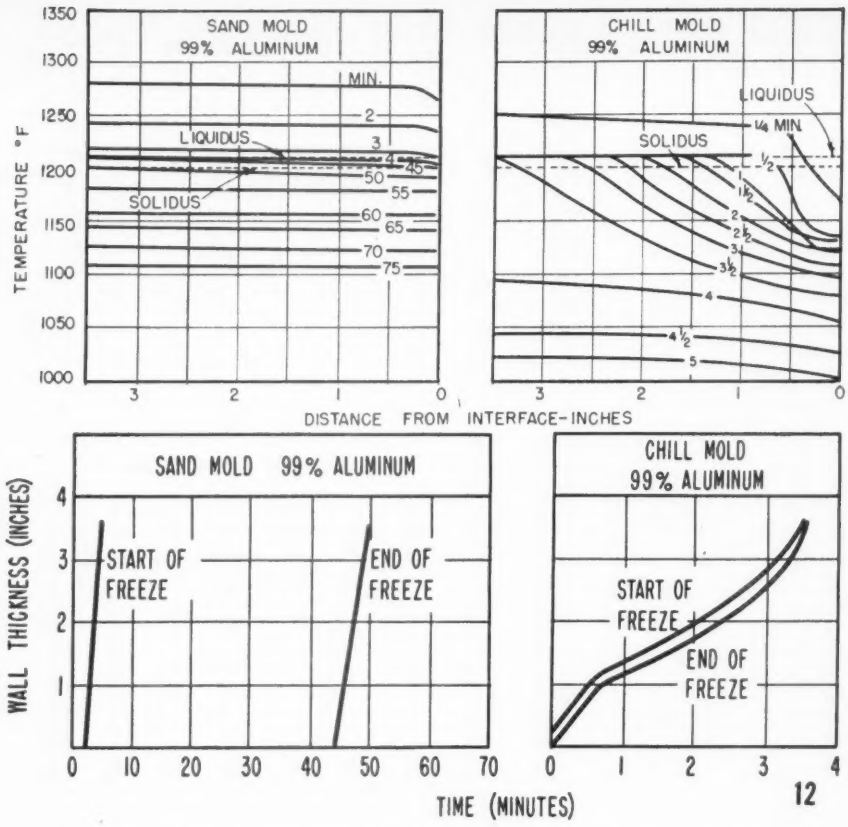


Fig. 11—Radiograph of transverse section (¼-in. slice) of 0.60 per cent carbon steel casting pressure bled when TTT solidification curves indicated a 1-in. thick completely solid skin had formed









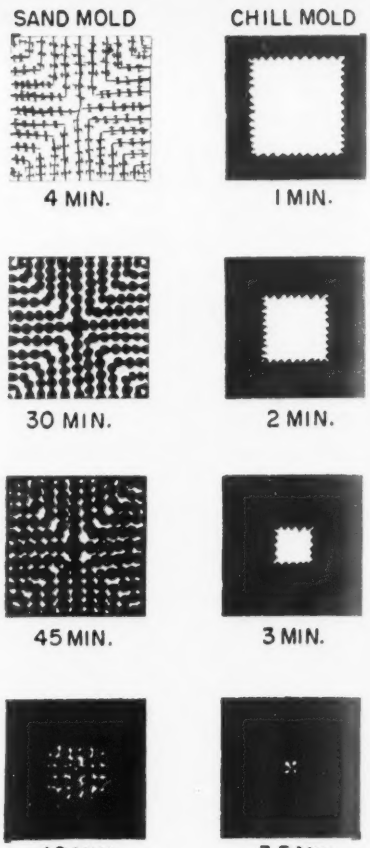
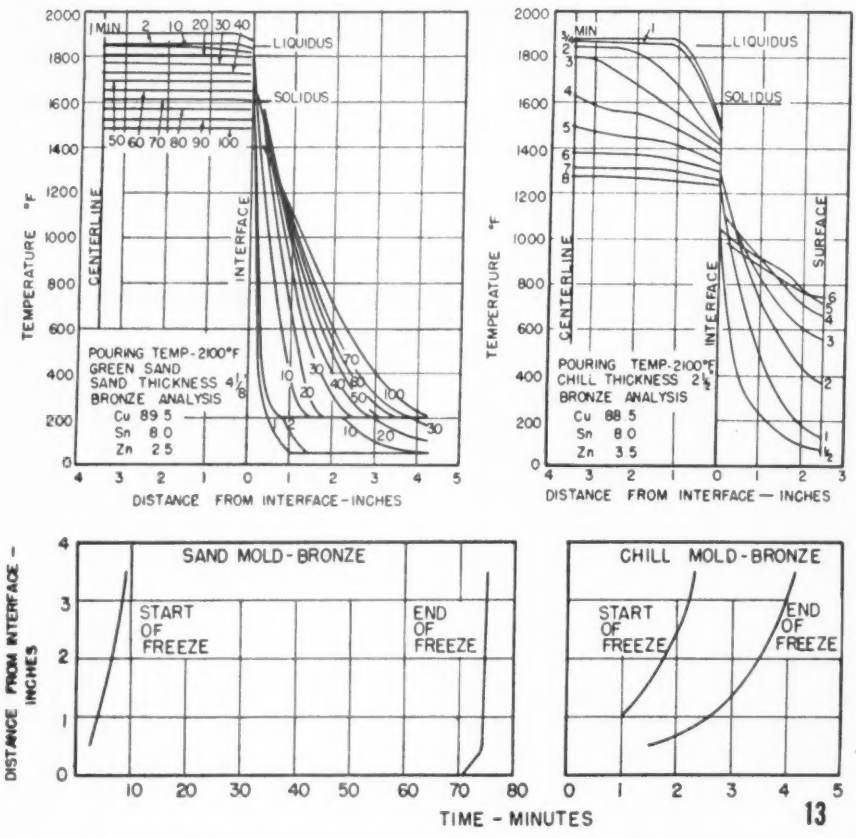


Fig. 12—Effect of sand and chill molds on the solidification of aluminum. Thermal gradients in castings shown at top; TTT solidification curves below, graphic representation of solidification at right



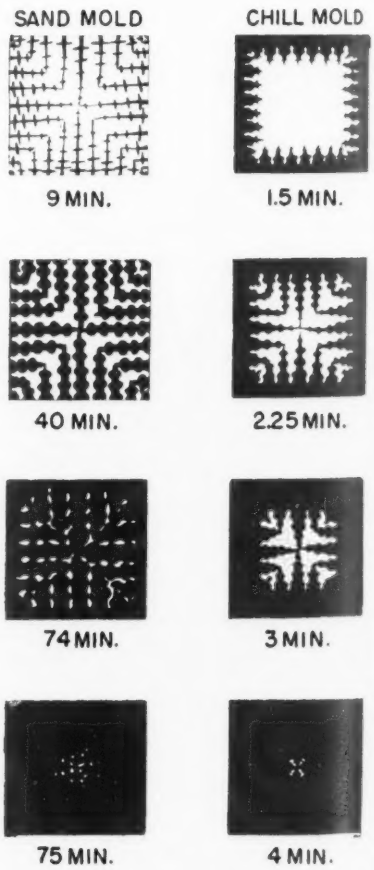


Fig. 13—Effect of sand and chill molds on the solidification of bronze. Thermal gradients in castings and molds shown at top; TTT solidification curves below, graphic representation of solidification at right

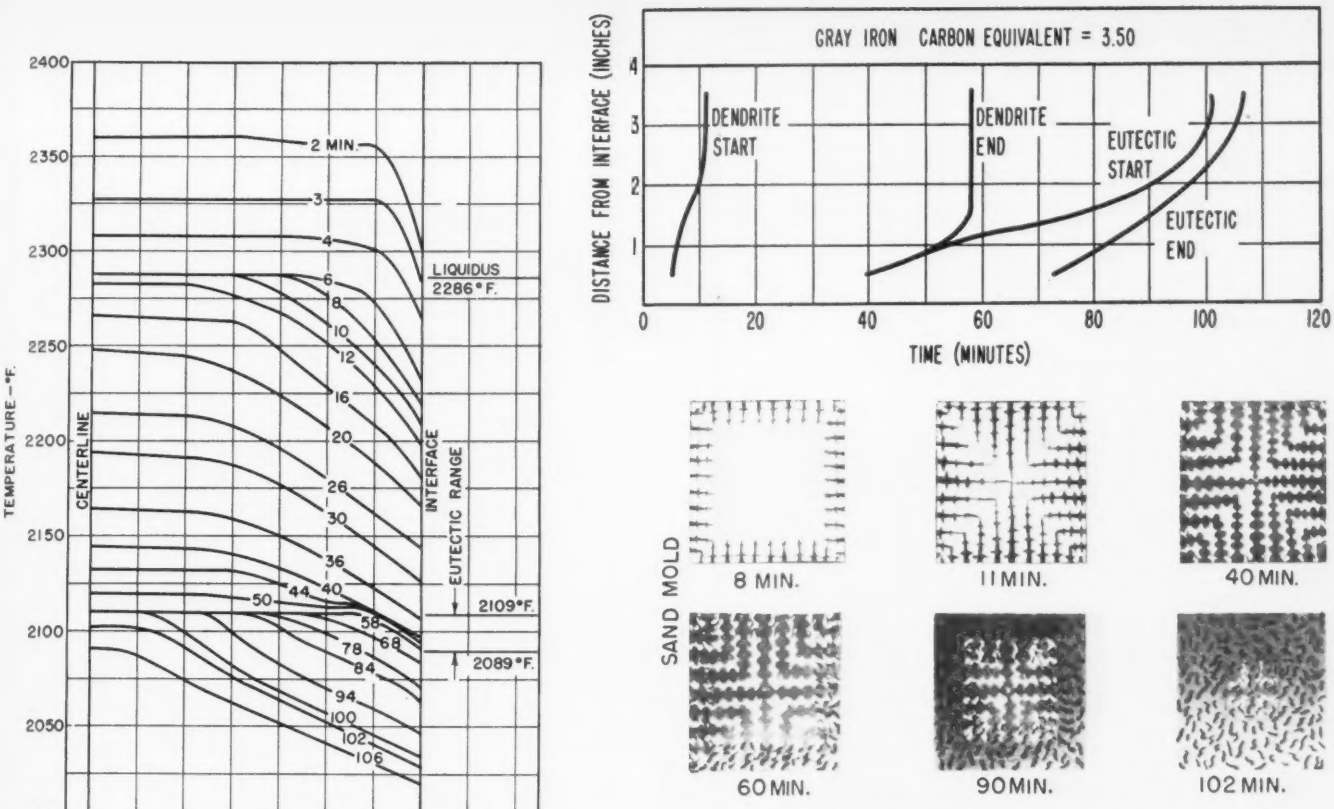


Fig. 14—Solidification mode of gray iron. Thermal gradients shown at left; TTT solidification curves above right, graphic representation of solidification below

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alloy undergoing solidification. Basically, these variations arise from the difference in thermal properties of both the mold and solidifying metal which govern the manner and rate of heat transfer.

Fig. 6 illustrates how some of these variables affect solidification. A mold having high heat capacity and high thermal conductivity, such as a metal chill mold, has the ability to absorb heat from the metal at a continuing rapid rate. The chill not only absorbs large quantities of heat for each unit of its volume (high specific heat) but also because of its high conductivity rapidly transfers heat from the chill interface to the entire chill volume. The interface of both the solidifying metal and the mold are accordingly maintained at relatively low temperatures and steep gradients are set up in the solidifying metal. This results, as indicated in Fig. 6A, in a narrow solidification band indicative of a high degree of progressive solidification.

On the other hand, a sand mold, which has low heat capacity and low thermal conductivity, will cause the same metal to solidify in a different manner. The sand cannot absorb much heat because of its low specific heat and, moreover, because of its low conductivity retains the heat close to the point where it is absorbed. Thus the sand near the casting interface quickly approaches the solidification temperature of the alloy. Only mild gradients can then form in the metal and the space separation between the "start" and "end of freeze" waves is great. In such a case there is only a low degree of progressive solidification.

The width of the solidification range of an alloy as shown on the constitution diagrams (temperature differential between liquidus and solidus) affects the degree of progressive solidification, Fig. 6B, even though the other properties of the metal and the mold remain constant. The gradients in both cases may be essentially the same but solidification is more progressive in the alloy with narrow solidification range because the gradients intercept the liquidus and solidus temperatures, which determine the position of the "start" and "end" waves, at more closely spaced locations.

Fig. 6C illustrates the relative solidification modes of alloys having high and low thermal conductivity when the other properties of the alloy are the same and a chill mold is utilized. (In a low-conductivity mold such as sand these effects are minimized. The differences are described in detail in a later section of the paper.) When thermal conductivity is high the heat tends to flow very rapidly from high temperature levels at the center to low temperature levels at the interface. In such a case when the mold removes heat from the (*Please turn to page* 253)

How to SELECT and MAINTAIN FLASKS

By C. A. GEHRMAN
Sales Manager
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Milwaukee

IMPORTANCE of selecting the correct type and size of foundry flask for the particular job, and then keeping the flask in good operating condition, cannot be stressed too strongly. Condition of the flask can have a marked effect on the quality of castings and the foundry loss caused by several types of defects.

Flask size is determined primarily by the size and contour of the pattern to be molded. Proper amount of sand around the pattern serves as insulation and prevents overheating of the flask walls, with consequent distortion of the flask and changes in pin centers. An ample amount of sand is good flask insurance. There is no need to skimp on the amount of sand, particularly when mechanical sand handling equipment is available. For small and medium size flasks, at least 2 in. of sand should separate the casting from the flask wall. At least 3 in. should be the minimum amount on larger jobs. Sand thickness should be increased where the outer part of a casting is in the vicinity of the flask wall. Gear blanks, flywheels, pulleys, hollow rectangular castings, etc., are familiar examples.

To cite an example of insufficient sand, a number of flasks provided with proper sand space were used satisfactorily for some time to produce a fairly large casting. Then a pattern for a still larger casting of the same general design was placed in the same flasks. In a short time the flasks became so distorted they would not fit on the molding machine and the parting surfaces were badly warped. After the flasks were reconditioned they again served satisfactory with the original pattern.

The cope on any flask should be deep enough to provide a thickness of rammed sand that will prevent the metal in the mold from breaking through. Cope thickness also should allow plenty of head room for gates and risers, without the necessity of building up pouring basins or head boxes. In addition to increas-

Fig. 1—Trunnions project far enough to clear the handles while the flask is suspended from slings

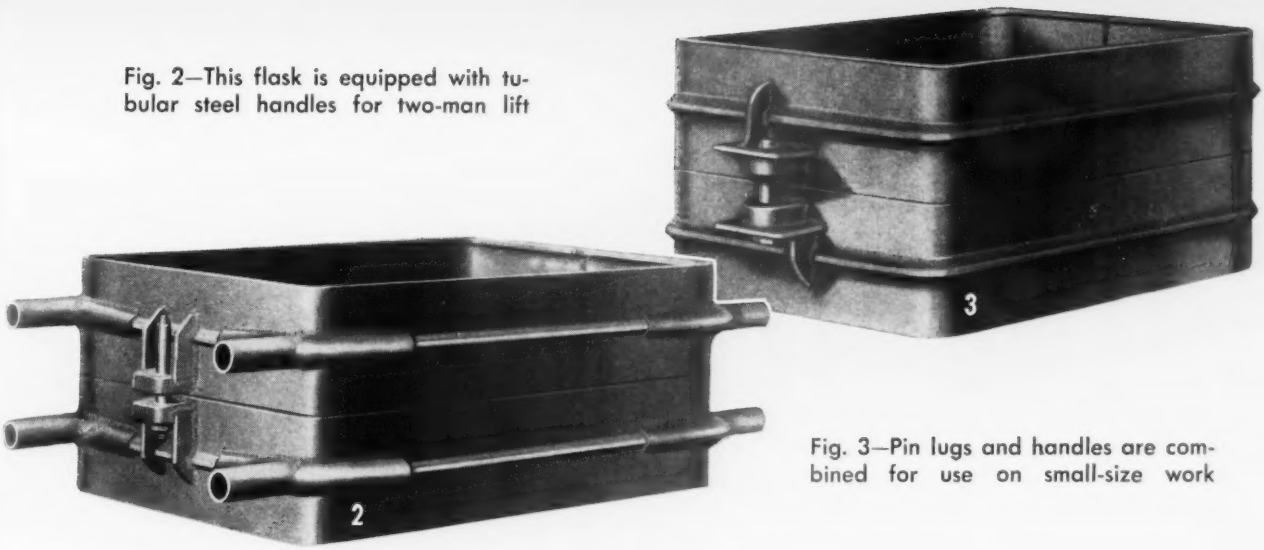


Fig. 2—This flask is equipped with tubular steel handles for two-man lift

Fig. 3—Pin lugs and handles are combined for use on small-size work

ing the cost of the section, these boxes prevent easy stacking of empty copes. Briefly, experience has shown that it is better to have too much sand over the top of the pattern than not enough.

The drag on a small mold should be at least 2 or 3 in. deeper than the pattern, and proportionally deeper for larger patterns. This thickness of sand prevents the casting from burning or charring a wood bottom board, or from overheating and warping a steel bottom plate. As in the cope, too much sand is better than too little. If grids take the place of bottom boards or plates, depth of the drag should be increased the same amount as the thickness of the grid. When a cheek, intermediate or middle part flask is employed, the depth is limited to correspond exactly to the middle or intermediate part of the pattern, as there is no sand over or under the cheek.

Fabricated steel flasks are designed to be as light as possible and still be sufficiently strong to do the job for which they were intended. They not only must be strong enough for the molding and pouring operations, but also strong enough to withstand the severe jolting on the shakeout. The trouble is accentuated when flasks are shaken out by hand. A reckless beating with maul and sledge hammer once or several times a day or night is bound to have a detrimental effect on pin centers and joint surfaces. Some foundries have batter plates welded in place to take the beating.

Factors of strength in steel flasks include thickness of wall, size of flanges and reinforcement. Some steel sections have reinforcing ribs rolled in to provide resistance to torsional and other strains. When this reinforcement is not considered sufficient, other reinforcement is added, usually by welding.

Through long experience the flask manufacturer is the best judge of design. A flask for use in a brass foundry would differ considerably from a similar size flask destined for use in a steel foundry. Varying anticipated conditions should be fully understood before flasks are designed and constructed. These conditions include: Metal to be cast; method of shakeout, type of mold sand—green or dry; pouring methods; molding methods; location of risers, shrinkheads and gates should be considered in determining size of flasks, also number of times each day the flasks will be used and special requirements to be met.

Hot metal generates gas and steam when brought into contact with mold and core walls. Vent holes should be provided in the flask walls for ready exit of the gas and steam. As not much gas is generated below the casting, the lower part of the drag does not require as much venting as the flask walls on a level with or above the casting.

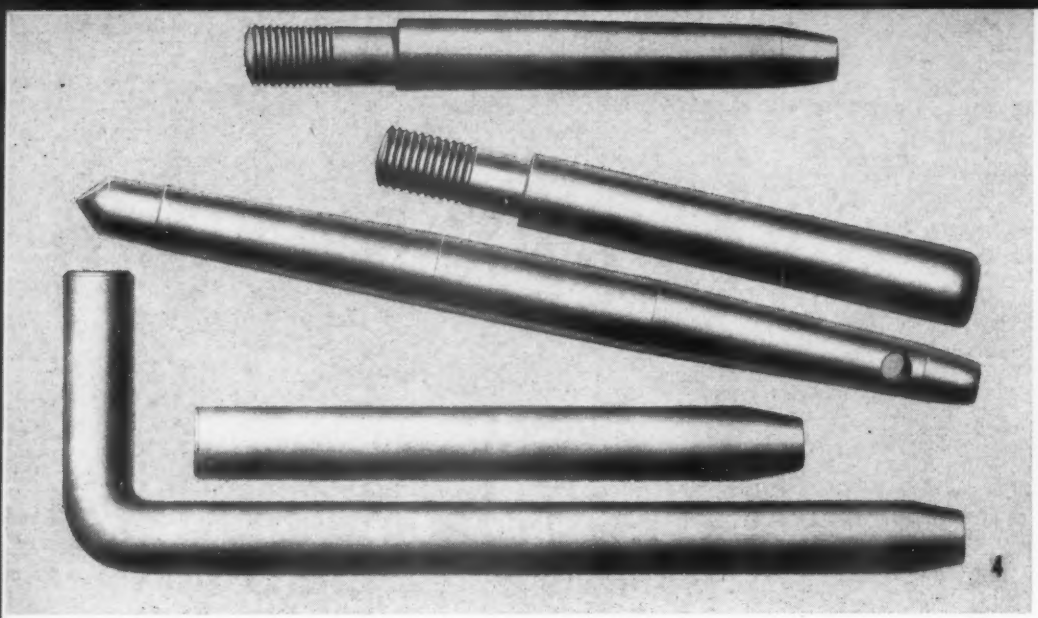
Type of pins to be used determines whether single or double pin lugs should be attached to the flask sections. Thread and nut pins, driven pins and stub pins require only single pin lugs on cope and drag. On stacked molds, double pin lugs are installed on all sections, usually with the short fixed pins on the upper pin lugs. The lower pin lugs are reamed, bushed or slotted. Hook type loose pins require double pin lugs on the cope and single pin lugs on the drag. For self centering loose pins, the cope has single pin lugs and the drag has double pin lugs. Pin lugs never should be used for clamping a flask since there is danger of changing alignment of pins and holes.

Rammed copes and drags within the lifting capacity of one man have flat or looped handles on the ends. If two men are required, tubular handles or handle sockets are provided. Larger sections empty may be handled by two men, but require some form of mechanical device when filled with rammed sand. Trunnions are attached to the ends or sides in addition to the handles. A variation of this construction is trunnion handles and a sling for rolling over. When the flask, filled or empty, is too heavy for two men, trunnions only are employed.

Parting surfaces should be machined true and level. Original flanges should be sufficiently thick for remachining several times.

Clamping bars provide anchorage for the clamps which hold cope and drag firmly in position during the pouring period, and until the metal has solidified. For a flask not over 24 in. long, one clamping bar at the middle of each side usually is sufficient. For a 30-in. flask two pairs may be needed, and of course additional pairs for flasks of greater area.

Number of clamps required does not depend as much on the weight of the casting as on the area



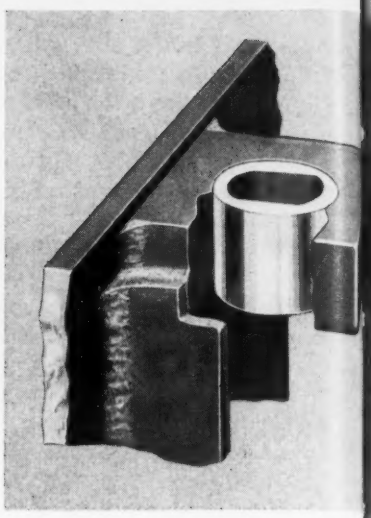


Fig. 4—Standard steel flask pins, ⅝ or ¾-in. diameter, may be straight or slightly tapered

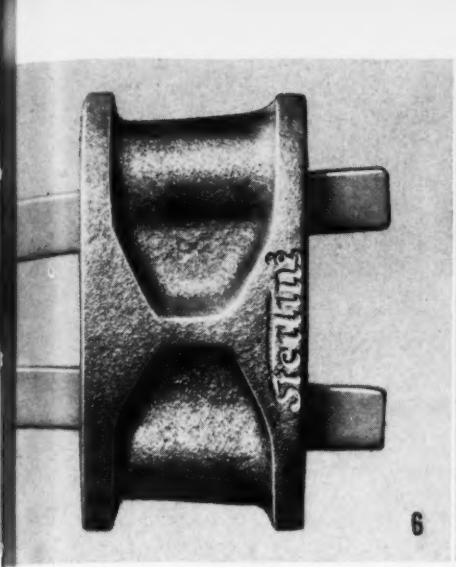
under the cope and the height of the pouring head. Consider an extreme example, a plate 48 x 48 x 1 in. thick, poured with a 12-in. head. Weight of the iron plate is 600 lb. In a vertical mold the narrow area in contact with the cope would be 48 sq in. The same plate molded in a horizontal position would have a cope area of 2304 sq in. In the first instance the cope would be heavy enough in itself without weights or clamps. In the second instance, with the cope weighing nearly 1 ton, additional weight of approximately 2 tons, or clamps on all four sides, would be required to hold the cope in place. Hammering the clamps after they are in position not only is useless but detrimental, since it may pull the bars from their proper position, and may break or stretch clamps to an extent that renders them useless.

Pin centers should be long enough to obviate the necessity of cutting any part of the flask section, center ribs or reinforcement, and thereby impair section strength. Other than this restriction, pin centers can be supplied by the manufacturer to suit existing pattern equipment and molding machine requirements. To avoid trouble and delay when ordering new flasks, pin centers should be specified accurately. Do not depend on a wooden extension rule. Use only a steel rule or scale.

Broached elongated bushings are preferable to slots. Round bushings are preferable to reamed holes in pin lugs. Bushings are replaceable when wear increases clearance between pin and bushing beyond specified tolerance. Large flasks, and flasks of any size in continuous molding and pouring programs, should have a slot or an elongated bushing at one end for ease of closing and to provide for expansion.

On small flasks with one round and one broached bushing, suggested clearance between pins and bushings is 0.005-in. With two round bushings the clearance should be 0.010-in. For medium size flasks with one round and one broached bushing the clearance should be 0.010-in. Clearance on large flasks should not be less than 0.010-in. between pin and broached bushing and 0.015-in. between pin and round bushing. With 1-in. diameter pins a broached bushing with greatest available elongation should be installed.

Fig. 9—Typical foundry floor where molds are poured continuously on elevated platforms. Fig. 10—Floor or clamped molds with pouring cups in place



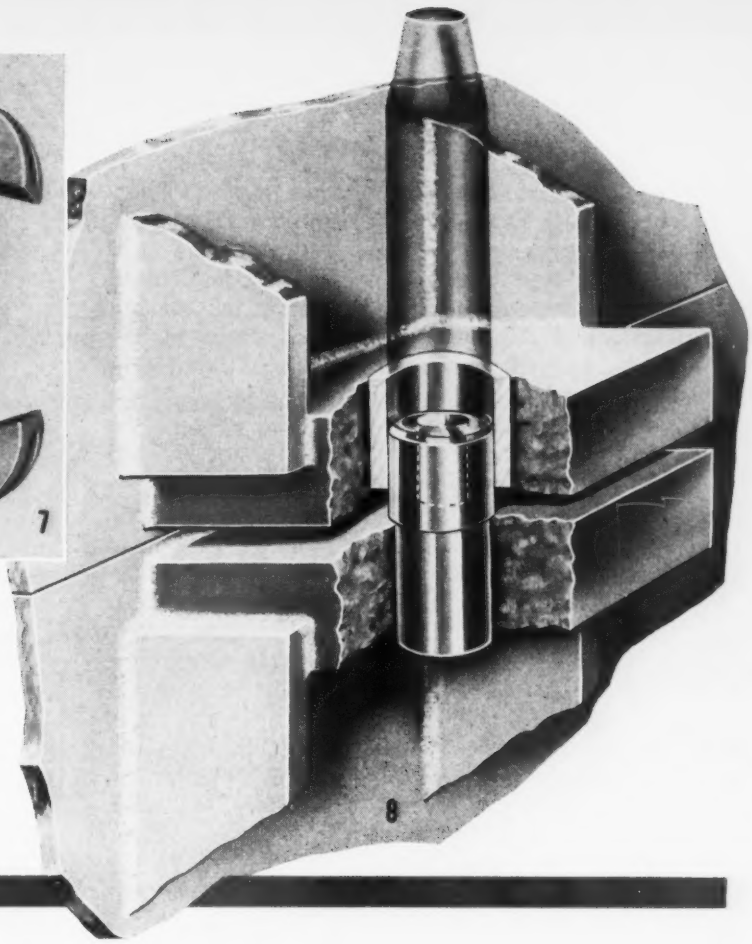


Fig. 5—Hardened steel bushing with elongated hole instead of slot. Figs. 6, 7—Malleable iron clamps used on tapered lugs. Fig. 8—Pin is hollow to receive extension closing pin

Pins may be classified under four general types—thread and nut, driven, stub and loose. The first and second are used in the same manner. They should be as short as possible, but long enough to guide the cope into place properly. Short pins are less likely to be bent in service. Lower end of the pin should be straight, as that part will be in the cope pin lug when the flask is closed. Above the straight part, the pin should have a slight taper, approximately the same as the pattern draft and be as long as the part of the pattern in the cope. If little or none of the mold is in the cope, or if the cope part has considerable taper, or is cylindrical in shape, a short pin without taper may be used. Pins are pointed at upper end for ease in closing. A good sound practice is to accept the manufacturer's standard pins and bushings to avoid expensive special sizes.

Hollow stub pins are driven into drag pin lugs. They project into bushings in the cope pin lugs. This reduces the shift hazard. A loose extension pin the same diameter as the stub pin is used when closing the mold. This closing pin seats in the hole in the stub pin. Hook type loose pins hang in the double cope pin lugs. Usually they are straight with a point at the lower end for entering the drag lug. They are removed when the flask is closed and clamped.

Self centering loose pins seat in lower drag pin lugs and project through upper drag pin lugs. Above the parting line they are similar in shape to thread and nut pins. Single pin lugs are installed at cope parting line. The pin is withdrawn after flask is closed and clamped. This type of pin is very accurate. Minimum clearance in top drag pin lugs is not over 0.005-in. Cope pin lugs have usual clearance for size of flask and type of foundry in which they are used. Hook loose pins require usual operating clearance in cope and drag pin lugs.

Cope bars hold the sand down when the mold is filled with molten metal and they help to lift the sand up during the molding operation. In the design of a flask the bars primarily are not considered a strengthening factor. In many instances after the flask has been in use for some time, it may be necessary to remove the bars and install (*Please turn to page* 97)

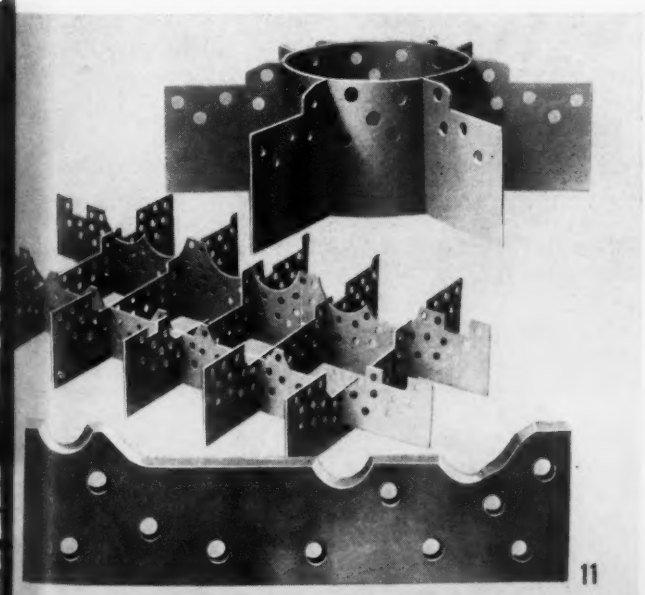


Fig. 11—Steel bars, single or assembled and cut to fit pattern, may be welded or bolted in place

STEEL foundrymen have for many years used blind heads that do not reach to the top of the cope, and therefore are in contact only with the sand of the mold. The air in this closed space is trapped by the steel rising in it, and expands enormously as it is heated by the fluid metal. The resulting back-pressure would often prevent the steel from completely filling the head, as the imprisoned air cannot escape through the sand pores fast enough to allow the metal to rise freely. To permit this air to escape, a small opening is provided, connecting the top of the blind head with the outside air. These vents are usually made nearly vertical, so that the steel that flows into them will not run out, and are so small that the metal solidifies quickly.

A blind head of this type soon freezes over at the top, and then differs in no way from an open head that has been permitted to solidify quickly, as illustrated in Fig. 21 (January issue). A single blind head set upon a casting as shown in this figure, therefore, feeds in exactly the same way as an open head that has frozen over early, the flow of the metal by gravity being almost completely free to take place. As mentioned previously, however, if the pressure of the outside air punctures the solidified skin of the casting at some point, atmospheric pressure will for a while hold up the steel in the head and prevent proper feeding. A core connecting with the interior of the blind head acts just as it does on an open head that is allowed to freeze over early, as desecribed earlier. Unless the casting punctures, such a core has no more effect upon the feeding efficiency of a single blind head set on top of a casting than upon that of the open head shown in Fig. 22 (January).

Since sand does not carry away heat from steel as rapidly as air does, blind heads normally solidify at the top a little more slowly, and therefore contribute a little more feed metal to the casting than do open heads that are allowed to freeze over undisturbed. When a good pipe eliminator is used on open heads, however, they solidify much more slowly, and

Gate

are able to contribute a larger proportion of their original fluid contents to feed the casting on which they are placed, than blind heads do.

As in the case where several open risers are used on a single casting, atmospheric pressure may affect the feeding of one or more uncored blind heads set on top of a casting, when they are used in conjunction with open heads attached to the same casting, and prevented from freezing over by the use of pipe eliminator. If the fluid metal in the interior of the partly solidified blind heads is connected through unfrozen steel in the casting to that in one or more open heads at the same level, which are kept open, atmospheric pressure will hold the metal up, counteracting gravity and keeping the blind head from feeding. The latter is then generally completely solid from top to bottom, having completely failed to feed the casting; in fact, the casting has fed the head. A core, extending into the interior of the blind head as in the case of the open one shown in Fig. 22 (January) will equalize the atmospheric pressure, and permit the metal in the blind head to feed down by gravity. The same thing applies to a single un-cored blind head used in connection with others in which cores are used; atmospheric pressure acts on the unfrozen metal in the

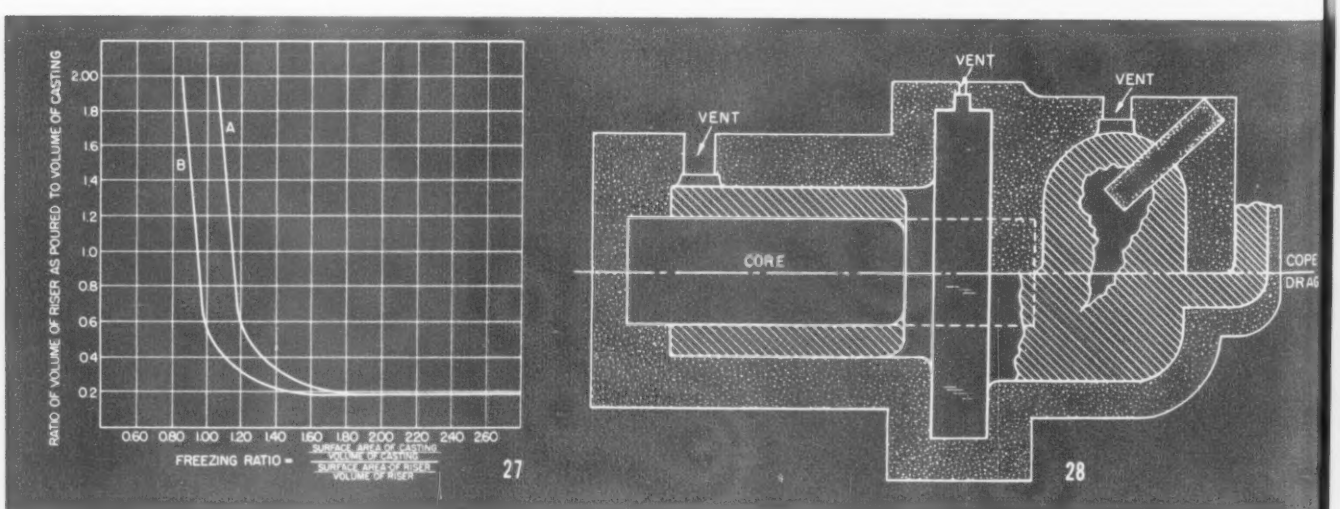


Fig. 26—One adaptation of the atmospheric pressure feeding method uses a ring-shape core set into the head. Fig. 27—Sizes of heads for castings without use of pipe eliminator (A) and with eliminator (B). Fig. 28—Method of applying atmospheric pressure feeding to blind head by use of a core which reaches well into the interior of the head

This fourth of a series of articles discusses the use of blind risers with steel castings and explains one method of determining the size of feeding head that should be applied to obtain a sound casting

...end Heads FOR STEEL CASTINGS

By JOHN HOWE HALL
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interior of the latter, and thence through liquid metal in the casting, will hold up the steel in the single uncored blind head, and prevent it from feeding properly.

Should a blind head be set on a casting below the level of open heads of equal or greater size, and the section of the casting between them be so large that the liquid metal in the heads at the two levels is connected by that in the interior of the casting, the blind head will not feed. In fact, it will be fed by the heads at the higher level, just as if it were a portion of the casting. If the blind head is not provided with a core, both gravity due to the difference of level between the two sets of heads, and atmospheric pressure, will tend to hold up the metal in it; if it is cored, gravity alone will act.

In some cases, not only will a blind head set at a lower level than open heads on the same piece be completely solid, but the portion of the casting located between the two sets of heads will be hollow because it fed the blind head, and the heads at the higher level did not contain enough feed metal to make both the blind head and the casting solid. From this it follows that a blind head should not be set part way down a casting on which there are other heads at a higher level, unless there is a thin section of casting between them, which will solidify early and prevent gravity and atmospheric pressure from acting to hold up the metal in the blind head. The latter then is called upon only to feed the portion of the casting close to it, just as if that part were a separate piece. The blind head and the adjacent portion of the casting then form a closed system like that of Fig. 21 (January), and the head is free to feed its fluid contents by gravity. A core into the head is not really necessary, except as a precaution against the puncturing of the solidified skin of the casting.

As may be inferred from the foregoing paragraphs, if heads are to be placed on top of a casting, blind heads are not as effective as open ones to which pipe eliminator is applied. In many deep castings on which top heads are required, however, there are heavy portions part way down that cannot be fed by the top heads without the use of excessive amounts of padding on intervening light sections. Side-attached heads then are set against these heavy parts of the casting, and are almost always made blind, because to carry them to the top of the cope would make them far larger than necessary, without any compensating advantage. A vent or pop-off is carried from the top of the head up through the cope, to permit the steel to fill the head completely, and as a rule a core is set in the head also, though it is not needed except as a precaution against the puncturing of the skin of the casting. As just described, when heads are to be placed in this way, the metal in the casting just above them must freeze early and so close off the top open risers. Sometimes it may even be desirable to place chills in the mold, located so as to hasten the solidification of the casting at such point.

When a blind head is located on a casting so that it is filled with steel that has been cooled nearly to its freezing point by running a long distance over the sand, an atmospheric pressure core sometimes will not function, because the top of the head is already partially solidified and freezes in a thick layer around the core. The latter then does not actually come in contact with the fluid steel farther down in the head, and therefore is entirely ineffective.

Williams Risers—The late George Batty and Henry Phillips were among the first to appreciate the importance of atmospheric pressure in feeding castings by heads, and the late John Williams, at that time associated with Phillips, adopted the idea and put it in practice when he worked out and patented[19] the type of blind riser that bears his name. In that development, the principles that have been described in the foregoing pages were effectively utilized to make atmospheric pressure drain a head of a large part of its fluid contents and force the displaced metal into a solidifying casting. In the method, as illustrated in Fig. 28, a blind head is attached to the casting at the bottom, and the sprue and ingate feed the steel into the head at its lowest point. Both casting and head are provided with pop-off vents to permit the escape of the air in them so that they will fill unimpeded; the vents also serve to show when the mold is full. The sprue and pop-offs solidify quickly, and atmospheric pressure is admitted to the interior of the blind head through a core provided for the purpose; the use of this (*Please turn to page* 212)

Cupro-Nickel Castings

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THE cupro nickels are a loosely defined family of copper base nickel-alloyed compositions. They might be described, for the purpose of this text, as copper-base alloys containing nickel up to 50 per cent. At higher percentages, they blend into the nickel-base, copper-alloyed compositions.

Nickel dissolves freely and fully in copper (Fig. 1), thus forming a progressive blend of solid solution material. The basic mechanical properties, as well as the corrosion resistance and heat resistance of copper are progressively improved with nickel additions. The electrical resistance is similarly increased. These properties are developed so smoothly for increasing nickel contents that the purchase and application of the alloys are simplified by defining them in terms of their respective copper-nickel content, viz: 90-10 or 80-20 or 70-30 cupro-nickel. In many cases, the cast alloys are made to match their corresponding wrought alloy relatives.

In the field of copper-base alloys, the demand for cupro-nickels over brasses and bronzes results from the higher order of resistance to corrosion, wear and heat or cold, which the cupro-nickels provide along with their higher strength, hardness, toughness and resistance to fatigue. Their corrosion resistance is, perhaps, their most outstanding attribute. Their ability to endure corrosives with little or no inclination toward pitting, leads them naturally into tube and pipe applications. Their anti-fouling capacity in sea water leads them into the condenser, heat-exchanger, valve, pipe, fitting, pump and marine castings service. Resistance to wear brings them into the valve seat, gland, bonnet and body services, as well as for corresponding parts of pumps. Resistance to effects of hot or cold temperature enlarges these uses further. Nickel-silver and other white metal or "appearance" applications are invaded by the cupro-nickels whenever a harder, stronger, stiffer or more corrosion-resistant alloy is needed. For applications involving contact with food products, where the presence of zinc or the occurrence of excessive contamination from copper, may arise, the cupro-nickel alloys become useful.

The wrought metal cupro-nickels are a relatively pure alloy of copper and nickel. They may be strengthened and hardened by cold working. Such procedures are impractical for the range of complex shapes and contours that constitute castings. Casting compositions may be strengthened and hardened by alloying them with ingredients which accomplish this purpose but might not be compatible with wrought metal processes. Cast compositions contain additions of hardeners such as iron, carbon, silicon, manganese, aluminum and tin. Nominal commercial compositions are shown in Table I.

Impurity maxima for these alloys follow a fairly constant pattern, viz: Pb .05, Al .05, Zn 1.0, Sn 1.0, C 15, S .02. Current U. S. Navy specifications allow higher aluminum contents and permit the use of titanium to accommodate their preference in manufacturing practice.

In contrast, U. S. specifications for the wrought alloys have thus far been limited to the 80-20 and 70-30 grades, with specifications for the 90-10 alloy in the development stage (Table II).

A similar compilation of the wrought alloys has been assembled by the Copper Development Association[1] (Table III).

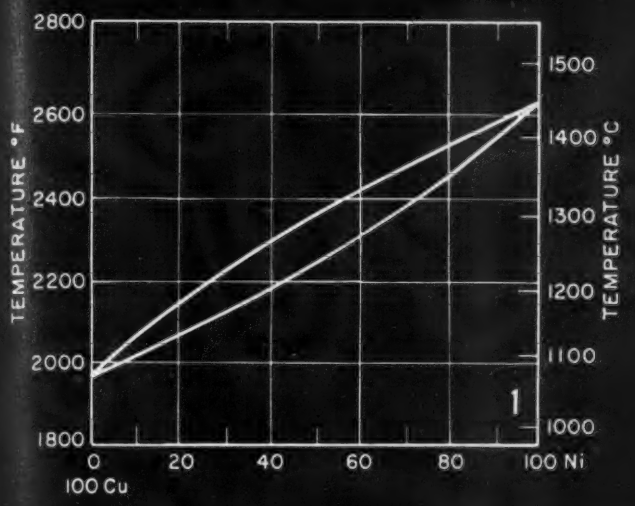
Foundry Practice—Foundry practice for the cupro-nickels follows a standard pattern. The procedure outlined for the 70-30 alloy is applicable to all grades. The 70-30 alloy meets most of the needs for this type of material and for that reason it is the most popular of the lot. Kihlgren[2] has described in detail a melting practice which up to now has successfully met modern requirements for pressure castings in a high-shrinkage alloy. Briefly, copper melting practice is

Fig. 1 — The copper-nickel constitutional diagram, indicating complete solubility in liquid and in solid (Hansen)

Fig. 2—Effect of silicon and iron on 30 per cent cupro nickel (containing 1 per cent manganese)

Fig. 3 — Effect of silicon on tensile properties of 90 copper-10 nickel alloy, heat treated

Fig. 4 — Polished cupro-nickel cast fittings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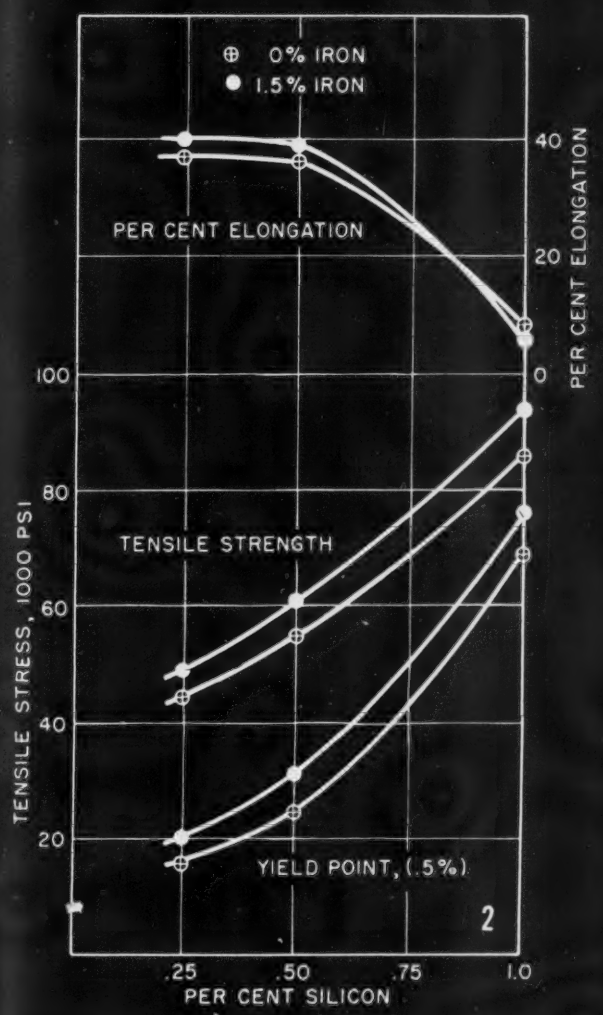
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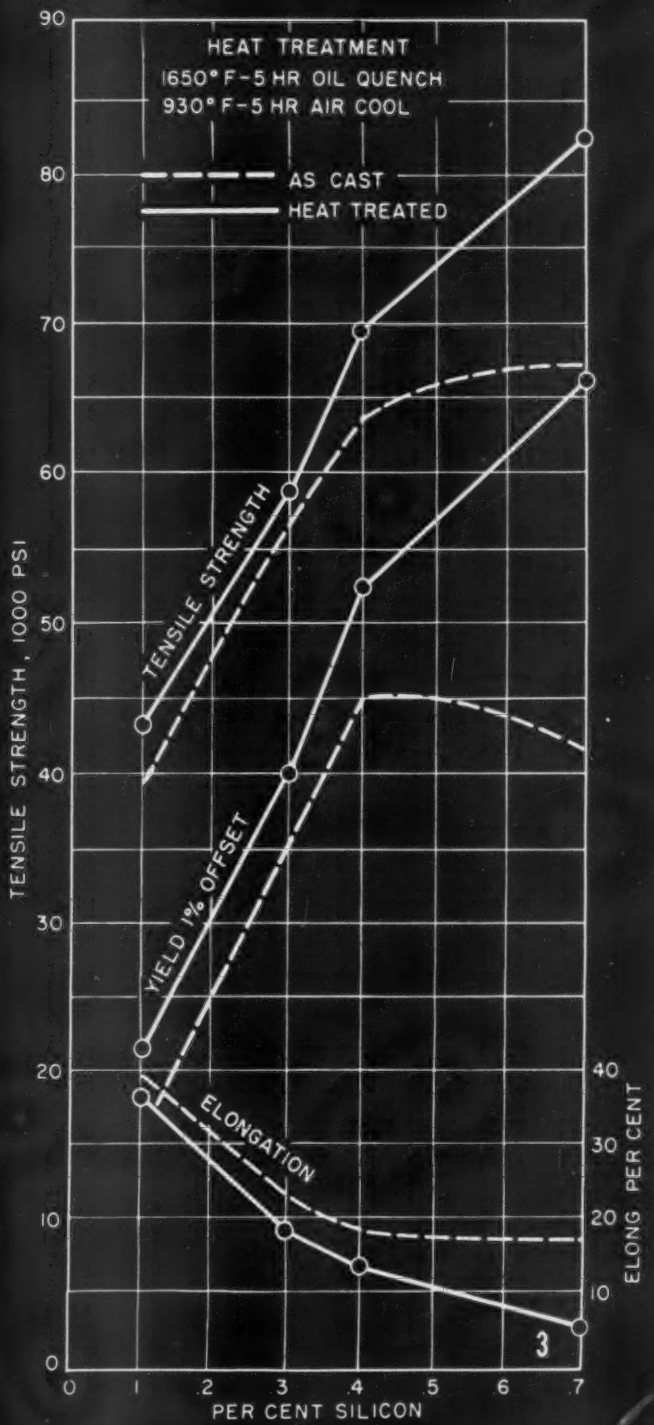
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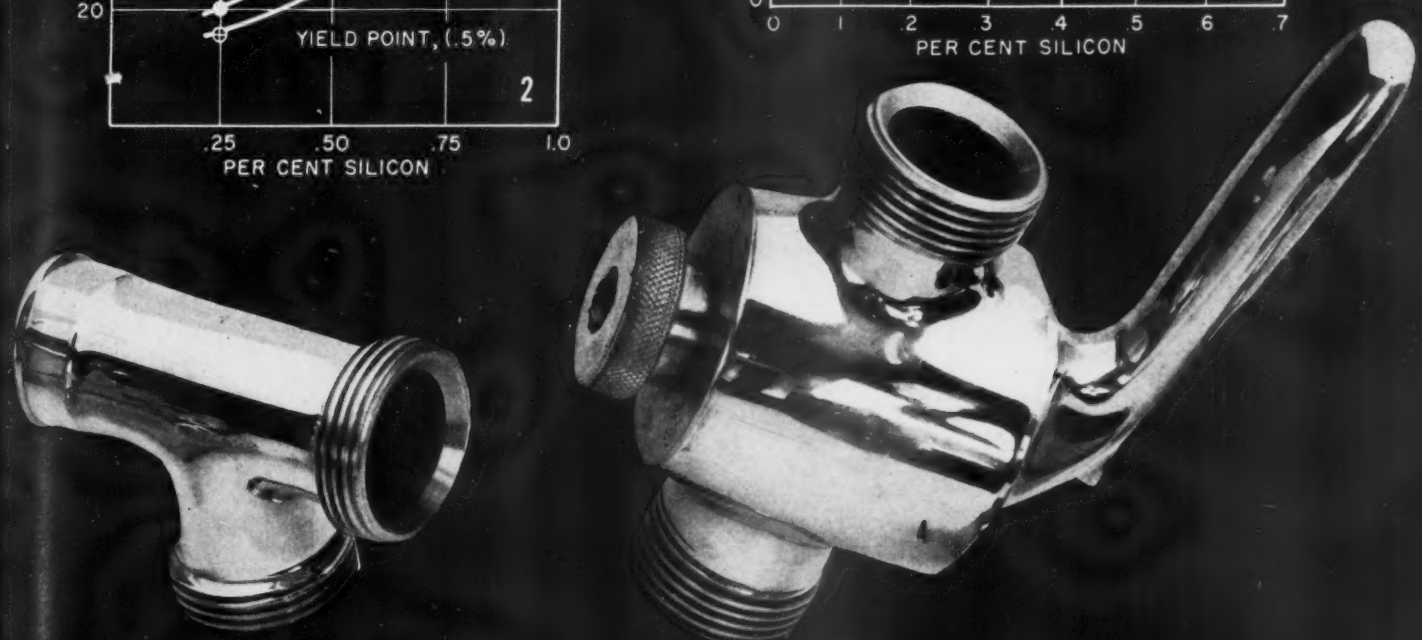


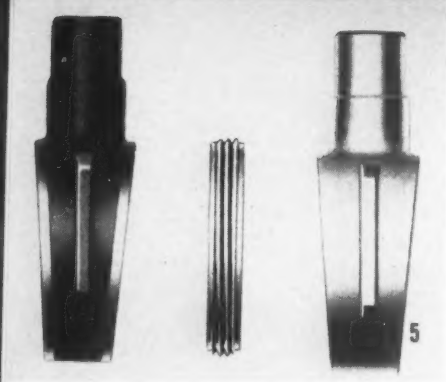


Fig. 5 — Typical cupro-nickel valve seat rings and disks

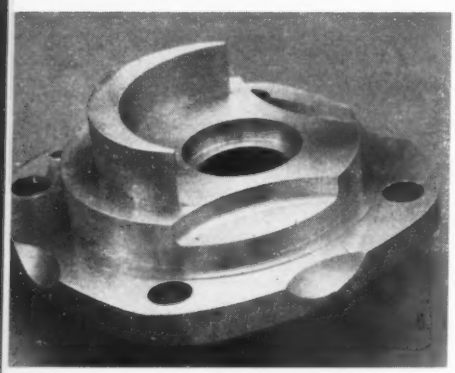


Fig. 6—Cupro-nickel pump part for handling dairy products. (Courtesy Illinois Iron & Bolt Co., Carpentersville, Ill.)

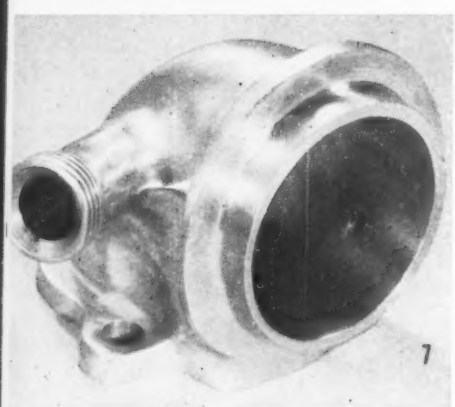


Fig. 7—Cupro-nickel fitting for ice cream manufacturing machine. (Courtesy Illinois Iron & Bolt Co., Carpentersville, Ill.)

employed. Avoidance of contact with sulphur, hydrogen and carbon is practiced. Other impurities are excluded. Oxidation of the metal is desirable during melting and is achieved by adding 1½ ounces of nickel oxide or 3 ounces of copper oxide per 100 pounds of metal to eliminate hydrogen as well as other oxidizable impurities.

Deoxidation in a three-step process, employing additions of manganese, silicon and magnesium, is recommended. A careful balance between manganese and silicon should be maintained. The quantity of these two elements together should not exceed 2 per cent. Usually a maximum ratio of 4 parts manganese to 1 part silicon provides for fine grain and density. A ratio of 2 parts manganese to 1 part silicon provides higher strength with lesser density.

The triple deoxidation practice resembles the procedure used for nickel-silver and, for that reason, perhaps, it confuses foundrymen. Impurities which are harmful to nickel-silver are assimilable in cupro-nickel. For example, iron, silicon and carbon, which are destructive to nickel-silver, are useful, within moderate limits, to cupro-nickel. Zinc, which is assimilable in nickel-silver, is undesirable in cupro-nickel. Sometimes the decision about which of the two alloys should be made in the foundry resides in determining which impurities are most likely to be present in the raw materials or introduced from the equipment and routine attending ordinary melting practice.

Some of the impurities may be helpful for certain purposes within specific limits—carbon, aluminum and tin, for example. Others would be generally undesirable. Lead, zinc and sulphur would be in this class.

Carbon—Carbon in amounts up to .15 per cent adds an increment of strength. Above .15 per cent it may form graphite which, if in flake form, reduces the strength moderately and the ductility seriously.

Sulphur—Sulphur is known to be detrimental to

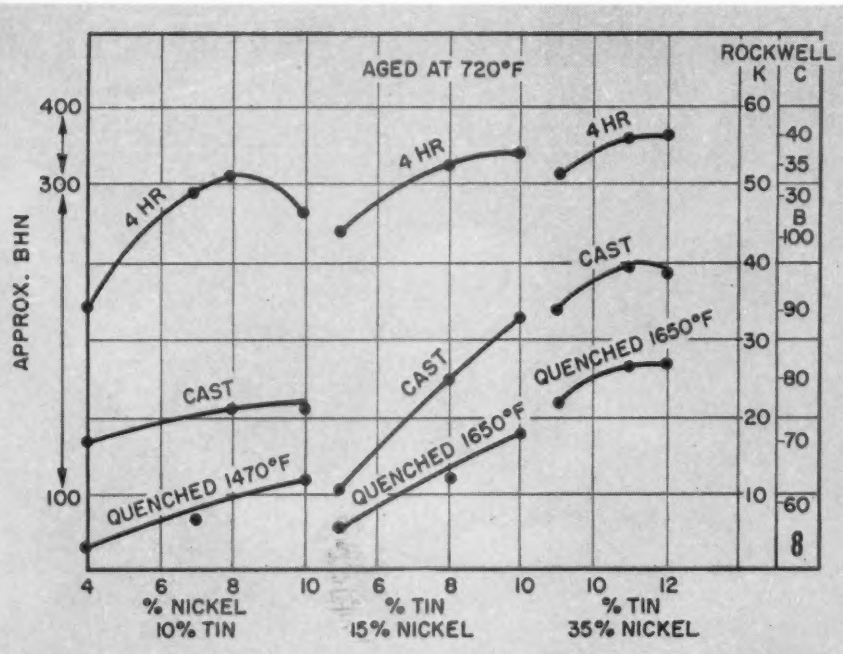


Fig. 8—Chill cast and heat treated hardnesses of tin-alloyed cupro nickels (Wise)

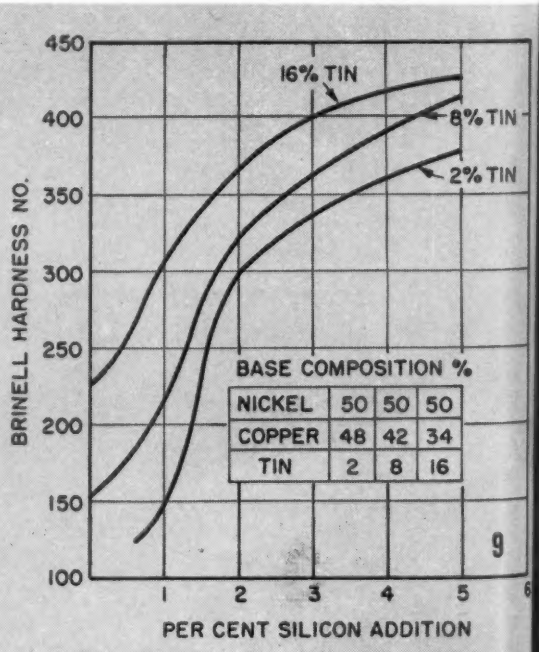


Fig. 9—Effect of tin and silicon additions on hardness of 50% Ni cupro nickel (Ballay and LeThomas)

TABLE I—Cast Cupro-Nickel Compositions and Properties

Cupro-Nickel	Ni	Cu	C	Mn	Si	Fe	Tensile Strength, psi	Yield Point, psi	Elongation in 2", %	Bhn
70-30	28-32	Bal.	.10	.90	.50	1.0	65,000	30,000	20	..
80-20	18-22	Bal.	.10	.90	.50	1.0	60,000	25,000	20	..
90-10	10-12	Bal.	.10	1.20	.10	1.0	45,000	20,000	25	90
Navy Spec. 46C8a June 1, 1947	28-32	Bal.	.15*	1.25	.70*	.25–.60	60,000**	32,000**	20**	..

* Maximum amounts. ** Minimum values.

the strength, toughness and soundness of copper and copper-base alloys such as the cupro-nickels. Principal sources of contamination are the raw materials, including oil-soaked scrap and the fuel used for melting. Sulphur scavengers are present in the alloying ingredient, manganese, and the deoxidizer, magnesium. With ordinary care, sulphur may be kept well below the .02 per cent maximum and held down to "trace" amounts.

Zinc—Zinc is considered undesirable. The usual oxidation practice and high melting temperatures invite heavy volatilization losses and the risk of producing porosity. Iron-zinc compounds may form in the solid, when iron is present, causing hard spots in wear or machining operations, and encouraging a pitting of the metal in corrosive environments. The iron-free composition which is lead, tin and zinc alloyed, is much less susceptible to damage.

Lead—Lead reduces the tensile properties in the presence of silicon, as shown in Table IV. The presence of lead in silicon-containing cupro-nickel is also fatal to the pressure tightness of the casting. A nominal limit of .05 per cent lead is proposed. As little as .02 per cent or less would be desirable. Lead damages the elevated temperature strength and produces hot shortness in the foundry or in welding or soldering operations. Nevertheless, lead may be used intentionally for improving the machinability of low-strength unalloyed cupro-nickels which maintain their

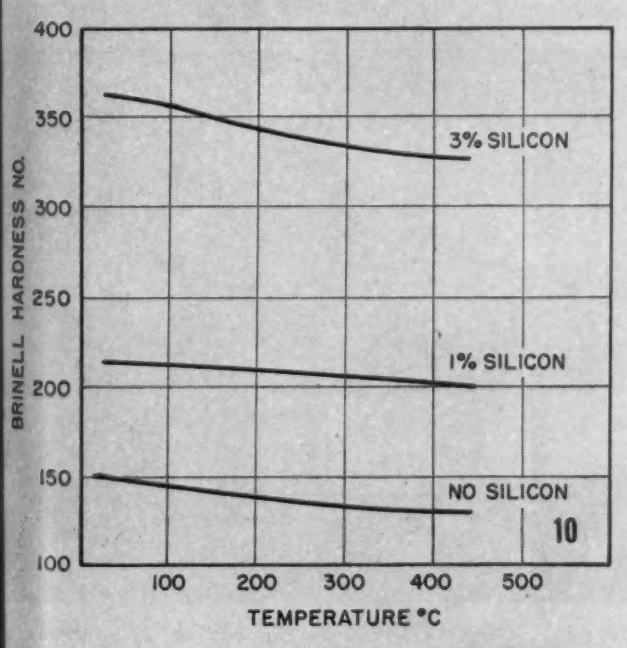


Fig. 10—Hardness up to 450°C of a 50% Ni 8% Sn silicon-alloyed cupro nickel (Ballay and LeThomas)

TABLE II—Tensile Properties of Wrought Cupro-Nickels

Cupro-Nickel	Tensile Strength, psi Min.*	Tensile Strength, psi Max.**	Rockwell B Hardness Min.*	Rockwell B Hardness Max.**
70-30***	58,000	94,000	67	91
80-20***	47,000	87,000	45	88
90-10	(Slightly lower than above—tentative)			

* Quarter hard. **Spring temper. *** See ASTM Specifications B122-49aT

TABLE III—Wrought Cupro-Nickel Compositions

Cupro-Nickel	Tensile Strength, psi Min. (a)	Tensile Strength, psi Max. (b)	Elongation % on $4\sqrt{A}$ Min. (a)	Elongation % on $4\sqrt{A}$ Max. (b)	Hardness Diamond Pyramid Min. (a)	Hardness Diamond Pyramid Max. (b)
70-30	60,500	94,200	45	8	85	160
75-25	56,100	87,500	45	8	80	150
80-20	48,450	78,500	45	8	75	140
85-15	47,100	71,750	45	8	70	130
95-5	38,900	67,250	50	5	65	120

(a)—Annealed. (b)—Hardened (cold worked).

TABLE IV—Lead Weakens Hardened Cupro-Nickel

	Tensile Strength, psi	Yield Point, psi	Elongation in 2"—%	Bhn
*70-30 Cupro-Nickel + 0% Lead	94,000	77,650	6	196
*70-30 Cupro-Nickel + .25% Lead	81,000	78,850	0	196

* Contains approximately 1% Si, 1% Mn, .10 C, .50% Fe.

inherent corrosion resistance at ordinary temperatures. A conversion of the popular 85-5-5-5 red brass to a 70 copper—30 nickel base, silicon free, and alloyed with lead, tin and zinc, will be discussed next.

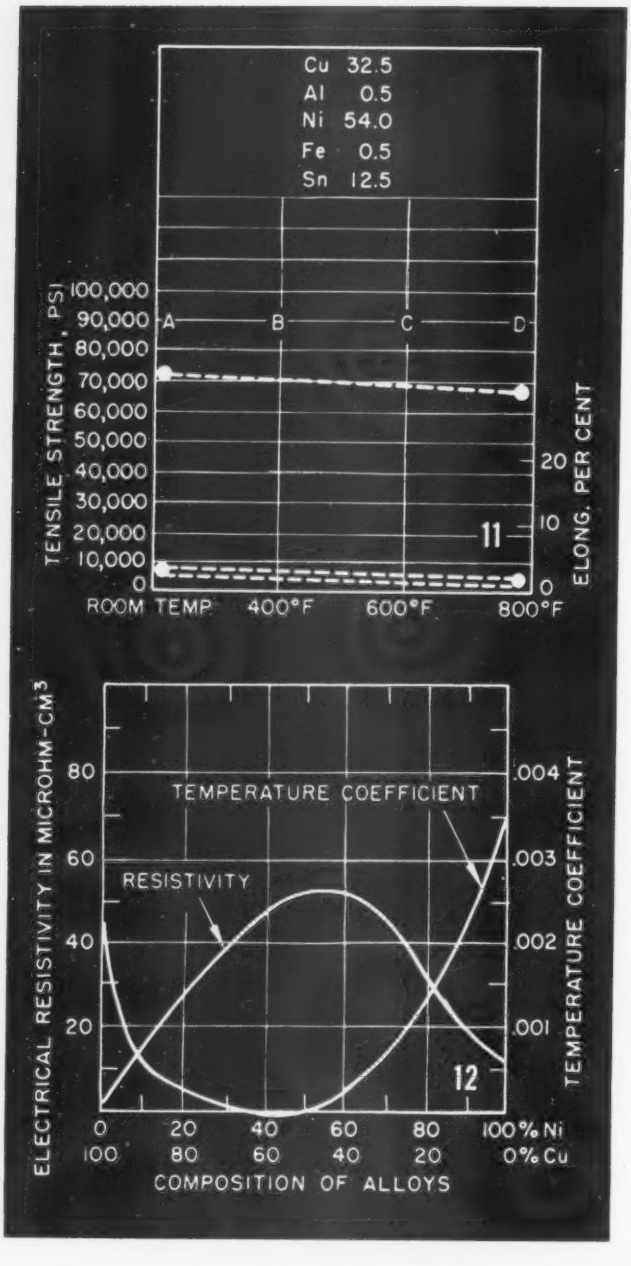
The cupro-nickel modification of valve bronze or 85 per cent copper, 5 per cent tin, 5 per cent lead, 5 per cent zinc metal, might be mentioned. It should be as nearly free of iron and silicon as possible to accommodate its lead and zinc content. It should be handled like nickel-silver (See "Nickel-Silver Castings," FOUNDRY, November, 1951, page 92). It is, in fact, a 30 per cent nickel alloyed, leaded nickel silver. Therefore, manganese and especially silicon should not be used as deoxidizers but phosphorus and magnesium used instead.

Its nominal composition and tensile properties follow: Cu balance, Ni 30, Sn 4, Pb 5, Zn 5, Mn 1.0; tensile strength 45,000 psi, yield point 27,000 psi, elongation in 2 in. 12 per cent.

It is useful for applications requiring a higher order of corrosion resistance than that available in the nickel-silvers, and a lower order of strength and toughness than that provided in the 30 per cent nickel cupro-nickel.

Alloying Ingredients—Among the desirable ingredients in cupro-nickel castings, iron, silicon, manganese and carbon are rated as essential, while aluminum, tin and other elements are employed for special purposes. The properties of the usual iron, silicon, manganese and carbon alloyed grades are shown in Table I.

Iron—Iron is usually present in excess of ½ per



cent and up to 1 per cent. At about this level, it contributes significantly to sea water corrosion resistance. Larger amounts decrease this advantage. Larger amounts of iron have been added to cupro-nickels to form the alloy called "Everbrite." Its nominal composition and properties follow:

Cu	Ni	Fe	Mn Max.	Si Max.	C Max.
60	30	8	.60	.60	.25
		(Desired)	.60	.20	.10

Tensile strength 75,000 psi; elongation in 2 in. 14 per cent; brinell hardness 180.

Manganese—Manganese and silicon might be regarded as complementary alloying ingredients. About 1 per cent of manganese is desirable for deoxidation and alloying purposes. It also seems to contribute somewhat to fluidity, by preventing the occurrence of silicon-rich films.

Silicon—Silicon at .25 per cent or less provides a tough, pressure-tight alloy. Larger amounts of silicon, up to .50 per cent, harden and strengthen the metal. (Fig. 2). Silicon, when unaccompanied by manganese, is free to exert its grain-coarsening and sideline effects of forming gas inclusions and hard particles. It has the additional habit, when present in quantity, of forming silicon-rich, internal films, inviting casting leakage. Suitable manganese additions, previously mentioned, correct this. This statement does not imply that silicon contents in excess of 1 per cent silicon, with their hardening effects, are not made. Such alloys correspond to the cupro-nickel correlatives of the silicon-bronzes. They are merely more difficult to process into dense, pressure-tight castings.

Fig. 3 shows how silicon additions up to .75 per cent act upon a cupro-nickel alloy of the 90-10 type.

Fig. 11—Hot strength of tin-alloyed cupro nickel (up to 800°F). Fig. 12—Electrical resistivity increases with nickel content up to 60 per cent nickel. A low temperature coefficient helps

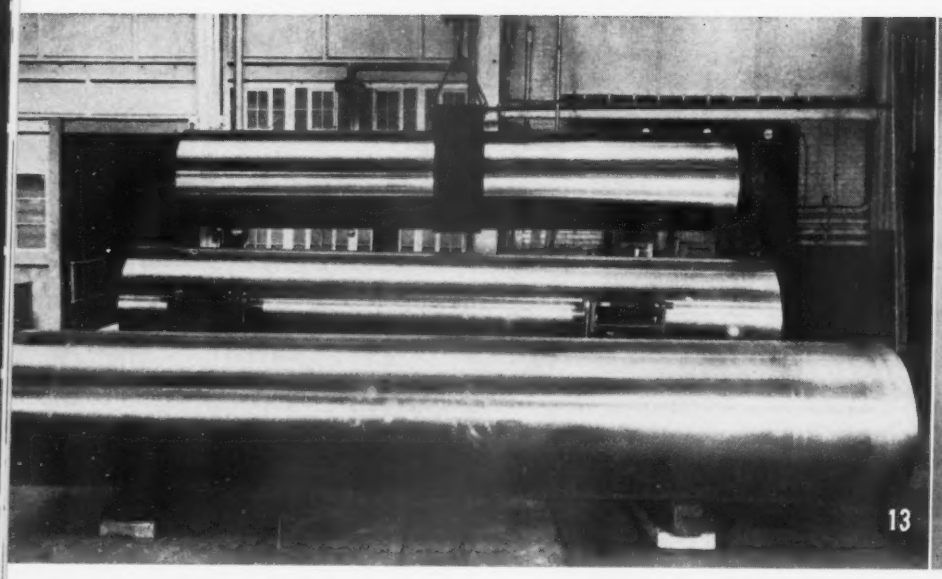


Fig. 13—Centrifugally cast cupro-nickel "suction rolls" for paper industry. Centrifugally cast, machined and drilled with thousands of perforations. (Courtesy Sandusky Foundry & Machine Co., Sandusky, O.)

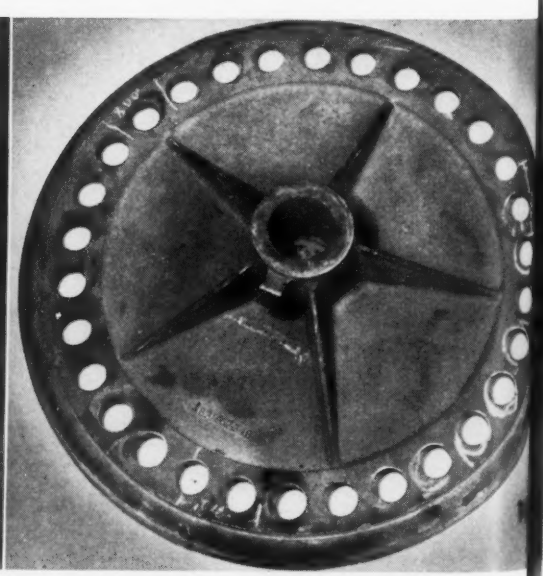


Fig. 14 — Cupro-nickel casting, 27-in. diam, for food processing machinery. (Courtesy Pacific Brass Foundry of San Francisco Inc.)

TABLE V—Typical Cast Cupro-Nickels Containing Tin (Hudson)

	CN20	CN40A	CN40B	CN50A	CN50B
Nickel %	20	40	40	50 Min.	50 Min.
Copper %	73	44	40	Bal.	Bal.
Tin %	6	5–7	8–11	4–5	6–8
Zinc %	1	1 Max.	1 Max.	1	1
Lead %	..	6–10	6–10	.01	Nil
Iron %	..	.50	.50	1 Max.	1 Max.
Manganese %	..	.25	.25	.50 Max.	2 Max.
Silicon %	..	..	.....	.....	.....
Silicon + tin %	(Sum of silicon plus tin—See Table VI)				6–12
Tensile strength, psi	56,000	44,800–53,800	44,800–53,800	51,600–67,300	56,000–89,500
Yield strength, psi	40,300	22,400–31,300	31,300–40,300	26,900–40,300	40,300–89,500
Elongation	7	6–10	1	10–20	1
Brinell hardness	120	100–120	120–170	100–120	150–400

When heat treated, the strength and hardness are substantially increased. With silicon additions of 1 per cent, a hardness of 240 brinell may be obtained in the heat treated alloy at a sacrifice in strength and toughness. Nickel contributes substantially to heat, corrosion and abrasion resistance.

General—Alloys of Table V are commonly used for pump, valve and fittings trim in service involving corrosion and erosion in water or steam. Alloy CN20 is a tin-alloyed, moderately hardened cupro-nickel.

Leaded cupro-nickels of the CN40A and CN40B type are used for bushings, sealing rings and valve stem or pump shaft contacts. The CN40A type works well against the relatively soft, stainless 18-8 steel, or Monel. The CN40B type is extra tin-hardened to function in contact with harder shafts.

Alloys of the CN50 type are widely used for valve trim. Alloy CN50A is stable at steam temperatures in the range of 650 to 850°F and possesses sufficient ductility to operate in unsupported positions in valve construction, etc. Indications are that the nickel content should be 10 times the tin content for purposes of avoiding aging effects in these high-nickel alloys. Alloy CN50B is susceptible to aging and its high hardness and limited ductility usually requires that it be backed up or supported by tougher metals when it is used as a seating or facing material in valves or pumps at elevated temperatures.

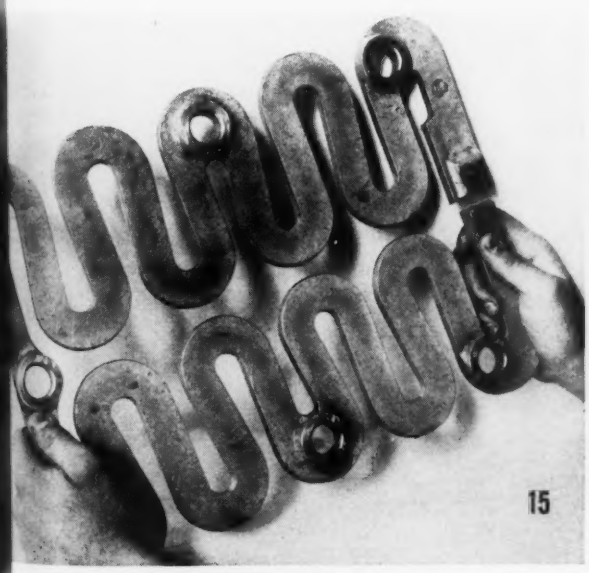


Fig. 15—Cast resistance grids containing 55 per cent copper and 45 per cent nickel, used for electric locomotives

TABLE VI—Silicon-Tin Cupro-Nickel

(Nominal Composition—40% Nickel, 8% Tin, Bal. Copper)

% Silicon	Bhn (Approx.)
1.0	150
2.0	210
3.0	320
4.0	360
5.0	410

TABLE VII—Commercial Tin-Alloyed Cupro-Nickels

	(a)	(b)	(c)	(d)	(e)	(f)
Nickel %	29	28	62	54	42	45
Copper %	57	62	27	33	42	45
Tin %	4	4.5	8.5	12.7	10	2
Iron %	1	1.50	2.5	.48	5	2
Zinc %	8	..	..	..	..	2
Lead %	1.0 max.	1.50	nil	..	nil	..
Manganese %	0.25 max.	.75	0.50	..	..	2
Aluminum %	..	..	..	.50	0.10	2
Silicon %	..	.75	0.50	..	0.10	2
*Tensile strength, psi.	65,000	65,000	75,000	70,000	85,000	...
*Elongation, %	3.5	3–5	1.5	.5	1.5	..
*Brinell hardness	210	230	250	350	270	270

* Heat Treated.

Silicon additions to tin-hardened cupro-nickels progressively harden the alloy, as shown in Table VI. Alloys of this type are proposed for castings exposed to corrosion and abrasion, for applications such as rollers, sleeves, slide valves and pump parts such as sealing rings or wearing rings. For many of the more rugged steam or corrosion resistant service requirements, the "S" and "H" Monel alloys have replaced the cupro-nickel compositions.

Tin-Alloyed Cupro Nickels—Cupro nickels alloyed with 2 to 10 per cent tin form a family of especially desirable hard and corrosion-resistant alloys. They may be used in their "hardened-as cast" condition or heat treated by quenching and tempering if desired. The theory and practice underlying the behavior of alloys of this type have been described in an earlier text ("The Nickel-Tin Bronze Theory," FOUNDRY, April 1951, page 130). Briefly, nickel and tin form a compound which, when precipitated in increasing amounts, progressively hardens the alloy. The excellent wear and corrosion resistance of this family of alloys and their capacity to resist pitting, scoring and wear at elevated temperatures, make them suited for applications in the valve and fittings industry for seats, disks, stems and bushings.

Many modifications are commercially produced. The 4, 8 and 10 per cent tin alloys, shown in Table VII, are typical.

As has been emphasized in previous references ("The Nickel-Tin Bronze Theory") lead and silicon may retard hardening by heat treatment, or develop micro-cracks where quenching treatments are involved. The quenching (*Please turn to page* 246)

Hardened

In this second of two articles discussing the study and testing of materials for use in engine cylinders and sleeves, molding and melting practices in the casting of these parts are described

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Gray Iron—

An Ideal Material for Diesel Engine Cylinder Sleeves and Liners

CURVES obtained by making standard dilatometer tests on iron give information on expansion and contraction, growth and transformation temperature ranges on heating and cooling. Figs. 6 to 10, inclusive, show such curves for copper-chrome alloy irons, both annealed at 1550° F and stress-relieved at 1050° F before testing; for molybdenum-chrome-nickel and low carbon un-alloyed irons annealed at 1550° F before testing; and a chrome iron annealed at 1850° F before testing. The testing procedure followed is given in *ASTM Book of Standards on Metals* under ASTM Designation B95-39. The average rates of heating and cooling were about as follows:

On Heating		On Cooling	
100-1200;	20° F/min	1800-1000;	11.4° F/min
1200-1800;	10° F/min	1000 - 500;	4.2° F/min
		500 - 100;	0.8° F/min

Strength Requirements of Cylinder Sleeves—The strength requirements of wet-type cylinder sleeves are greater than those of the dry-type, since the wet-type are supported in the top deck and bottom deck of the crankcase only, while the dry-types are supported over practically their entire outer surfaces as they are fitted into accurately machined cylinders integrally cast in the cylinder blocks.

The circumferential tension in our wet cylinder sleeve walls due to maximum explosion pressure of 1000 psi, if unsupported in the crankcase, would be about 7600 psi, computed by using the thin-walled pipe formula $S = Pd/2t$ where

S = tensile stress in psi
P = internal pressure in psi
d = internal diameter, inches
t = wall thickness, inches

The values for our wet-type cylinder sleeve used in our six-cylinder and largest four-cylinder diesel engines are: P = 1000 psi; d = 4.75 inches; t = 0.3125 inches.

The cylinder sleeves have flanges at the top ends, however, and are supported in the top decks of the crankcases so that strength requirements are accordingly lower. It will thus be seen that hardened iron with tensile strengths of about 35,000 psi and up afford a very large factor of safety.

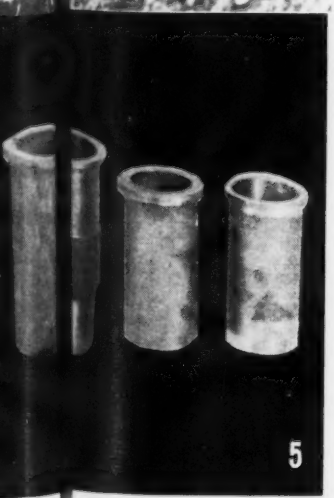


Fig. 5—Examples of rough and finish machined sleeves and liners used in internal combustion engines of tractors and trucks

Effect of Surface Finish—Tests have been made of the effect of surface finish of the inside diameters of diesel sleeves on wear and oil consumption in 100-hour tests which would more than cover the "break-in" period of a motor. The "mirror" finish originally used was approximately 10 to 15 micro-inch as determined by the root-mean-square method. Tests were made using sleeves with a "satin" finish of 40 to 50 micro-inch. Practically no increase in rate of wear or in oil consumption was found with the latter finish. Its use resulted in increased production, and it is in use today.

Tests on surface finishes of hardened gasoline engine liners indicated that avoidance of a sharp-edged "saw-tooth" effect in finishing was of equal or greater importance than depth of surface indentations. Thus a finish with a profilometer reading of say, 40-50 microinches, with a flat plateau surface between "valleys" will show less wear during break-in than a finish with the same profilometer reading but with a sharp "saw-tooth" effect between valleys.

The fact that the cylinder blocks and crankcases, into which cylinder sleeves and liners are fitted, are made of gray iron is a factor in favor of the use of the same material in sleeves and liners. Various physical properties of importance in the performance of the motors, such as thermal expansion-contraction characteristics and vibration damping properties, are practically the same in both applications.

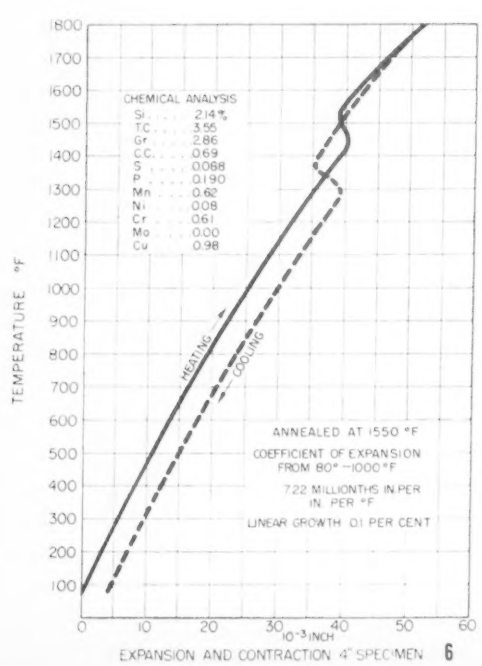
Molding Data—All of the sleeves produced in our own foundries are cast vertically in green sand molds, the only oil sand cores used being small skim cores. The gating consists of bottom tangential gates through "hot" blind risers. This assures that metal enters the mold cavities with a circular flow around the cavities, avoiding formation of hot spots which cause porous areas (shrinkage cavities), and also assures adequate feeding of the sleeves by getting the last and hottest metal in the blind risers.

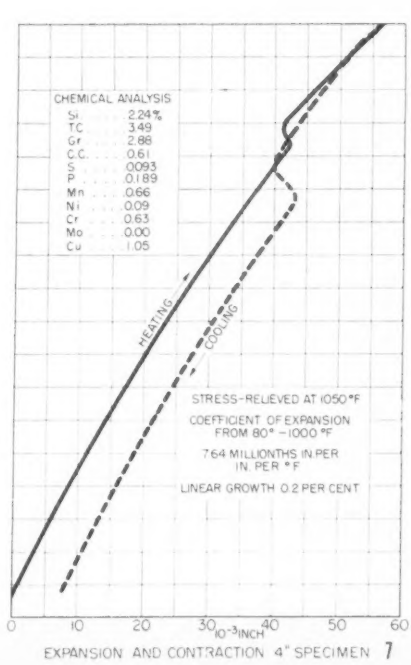
The cope portion of the molds are made on jolt, push-off machines. Fig. 12 shows a cope machine and pattern equipment. The drag portion of the molds are made on jolt, roll-over, draw machines. Fig. 13 shows a drag machine and pattern equipment. Fig. 14 is a rammed-up drag in which may be seen the small oil-sand skim cores set in the gating system. Fig. 15 shows a complete mold of eight sleeves with sprue, runners, risers and gates after being shaken out of the mold and before being cleaned. The small flow-offs shown at the top ends of the rough castings are no longer used.

Molding sand used in sleeve molds has the following properties: Moisture 3.0-4.0 per cent, permeability 60.0-75.0, green shear strength 1.5-2.0 lb. Facing sand used, made up of heap sand, fine molding sand, silica sand, bentonite, pitch and seacoal, is slightly lower in permeability and strength.

Melting Practice—Metal for the hardened molybdenum-chrome-nickel diesel sleeves originally used in production was "cold melted" in a direct-arc electric furnace. Later, as production increased and greater tonnages were needed, melting practice was changed. A low carbon iron of about 1.90 per cent carbon was melted in the electric furnace and one-fifth by volume of this metal was mixed with four-fifths of our base cupola metal (steel-mix cylinder iron) in 2500-lb ladles to obtain the 3.00-3.10 per cent carbon iron desired.

A second direct-arc furnace was installed and other applications were made of the fairly low carbon iron thus produced, principally in castings for our crawler tractors. Increasing demand for additional tonnage led to "cold melting" of steel of about 0.40 per cent carbon and mixing with cupola metal in the proportions of about 10 per cent steel to 90 per cent cupola metal to obtain the desired final carbon content. By





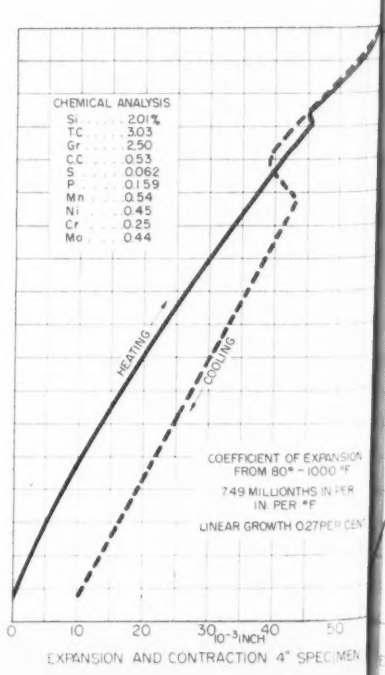


Fig. 11—Type of corrosion encountered on outside diameter of wet type diesel engine sleeves cast with unalloyed gray iron. Sleeves were hardened to 45 to 55 Rockwell C

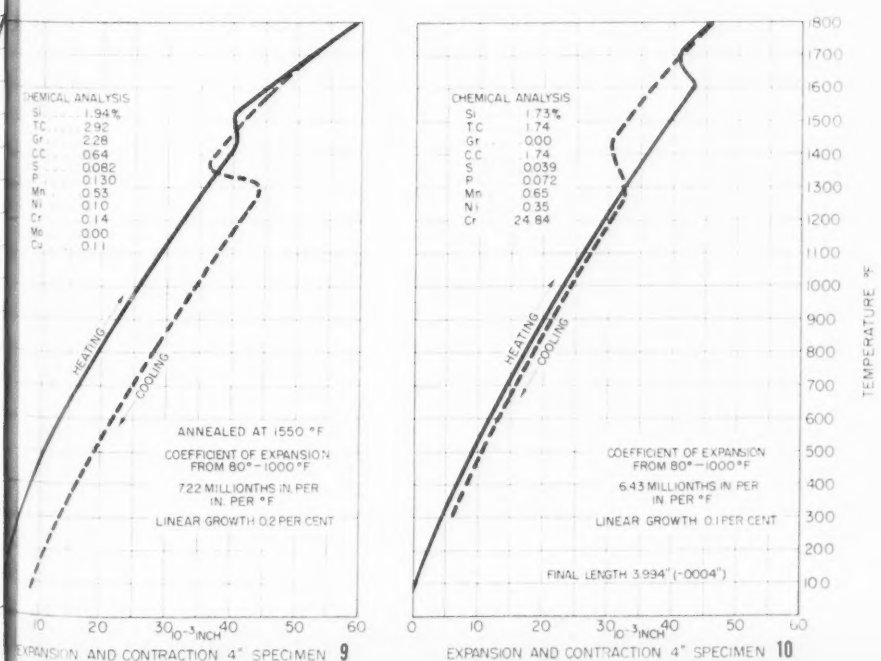
this means, about 45 tons of mixed metal have been produced in an 8-hour shift, using one ton-per-hour electric furnace and one 500-pound-per-hour electric furnace.

A number of rough and finish machined sleeves and liners are shown in Fig. 5. Sketches of assemblies of dry and wet-type sleeves in crankcases are shown in Figs. 16 and 17.

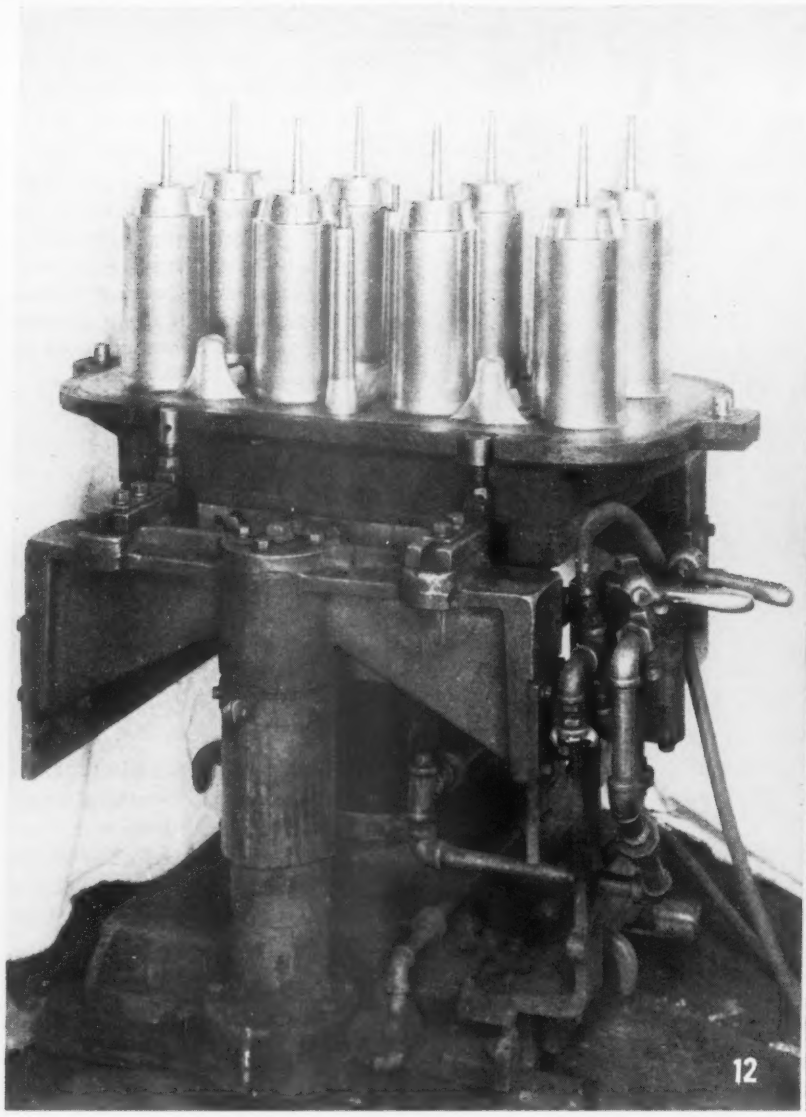
Corrosion of Wet-Type Sleeves — Corrosion of the outside diameter of the wet-type hardened diesel sleeves cast with unalloyed gray iron that were put in service in 1942 was encountered after varying lengths of service ranging from as little as 72 hours and up to 11,000 hours.

Fig. 11 shows a typical example of such corrosion. It was usually found in a rather narrow vertical band at points where coolant volume and flow were restricted, such as adjacent to the tappet wall or at 90 degrees where two sleeves were adjacent to each other. The number of such corroded sleeves reported was less than 1 per cent.

We had never encountered this problem when using alloy iron sleeves. Numerous engine tests were made with various coatings on the OD of unalloyed iron sleeves, practically none of which was effective. These coatings included copper, aluminum, sealer (red nitro-



Figs. 6-10 — Dilatometer curves for various grades of gray iron. Figs. 6 and 7 — Copper-chrome iron. Fig. 8—Molybdenum-nickel-chrome iron. Fig. 9—Unalloyed low-carbon iron. Fig. 10—24 per cent chromium iron



cellulose type), lacquer and a number of proprietary coatings.

Some consideration was given to the use of inhibitors in the coolant and to the use of expendable aluminum or magnesium anodes to render the unalloyed iron sleeves passive. The final decision was to return to the use of copper-chrome alloy iron in all wet-type diesel sleeves. As no such trouble was possible with the dry type liners their production in unalloyed gray iron was continued.

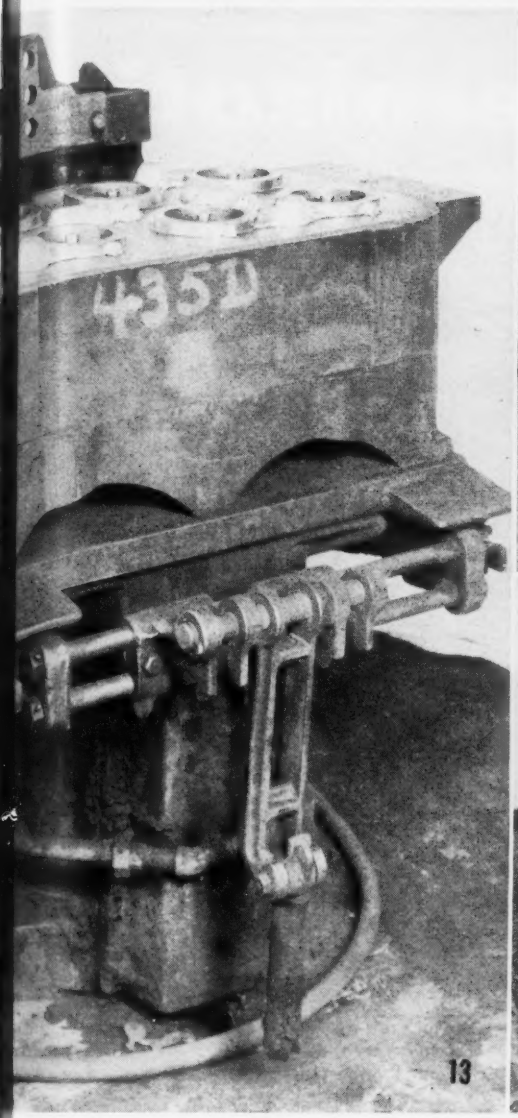
Other Problems with Unalloyed Hardened Sleeves—Hardened dry type cylinder liners are used in the largest sizes of International gasoline truck engines. The thinnest of these is about 1/16-inch thick. The various irons used in these truck gasoline engine liners paralleled the use of the various irons tested and used in our diesel engines.

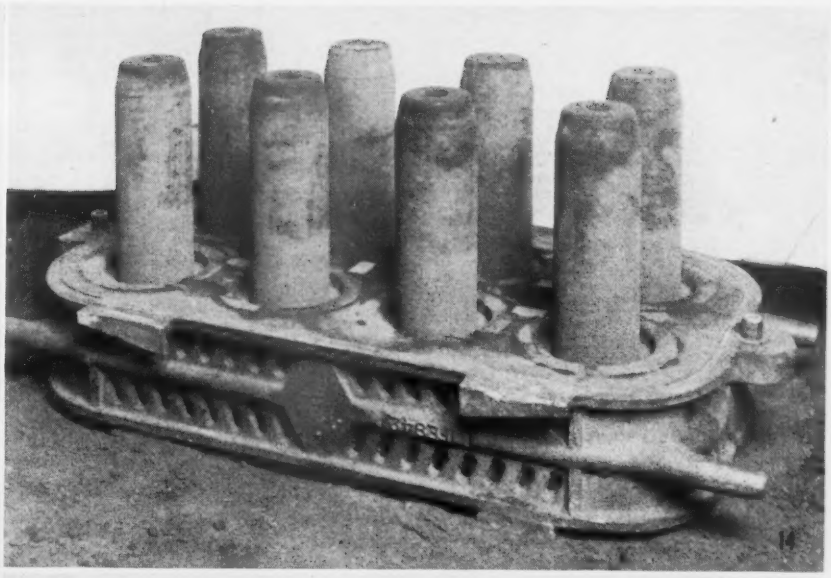
When using unalloyed iron it was found that the top, combustion ends of the thinnest liners tended to contract, resulting in decrease in heat dissipation, due to lack of contact with the cast-in cylinder walls, and a drop in hardness.

The curves shown in Figs. 3 and 4 (January FOUNDRY, p. 89) demonstrate that the molybdenum-chrome-nickel iron is less affected physically by fairly high drawing temperatures as compared to the unalloyed irons. Engine tests run for 100 hours to compare results confirmed this as the contraction of the alloy iron liners was only 0.00081-in. as compared to 0.00168-in. contraction (decrease in ID at the top end of the liner) for the unalloyed iron liners.

As a result of these tests the use of the molybdenum-chrome-nickel alloy iron was resumed for the dry type hardened liners used in our truck gasoline engines.

Acknowledgments—The author wishes to acknowledge the work done by the many persons in our former Gas Power Engineering Department who participated in the testing and examination of the various metals. The numerous tests made by the personnel of the Metallurgical and Materials Testing Laboratories, under the direction of H. B. Knowlton and Frank Sailer, particularly the many physical tests made under the supervision of R. J. Murphy, and the hardenability tests made by E. H. Snyder, are greatly appreciated. The author also wishes to express his appreciation to the executive personnel for permission to publish this material.





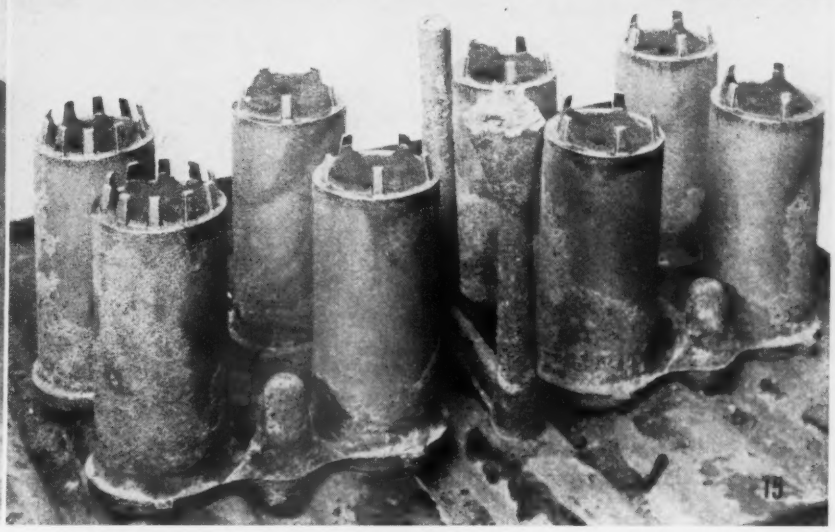


Fig. 12—Pattern equipment and jolt machine used in molding sleeves. These are for cope portion

Fig. 13—Drag half of mold is made on this jolt, rollover, draw machine. Pattern shown in place

Fig. 14—Rammed-up drag in which may be seen the small oil-sand skim cores set in gating system

Fig. 15—Complete mold of eight sleeves with sprue, runners, risers and gates in the as-cast condition

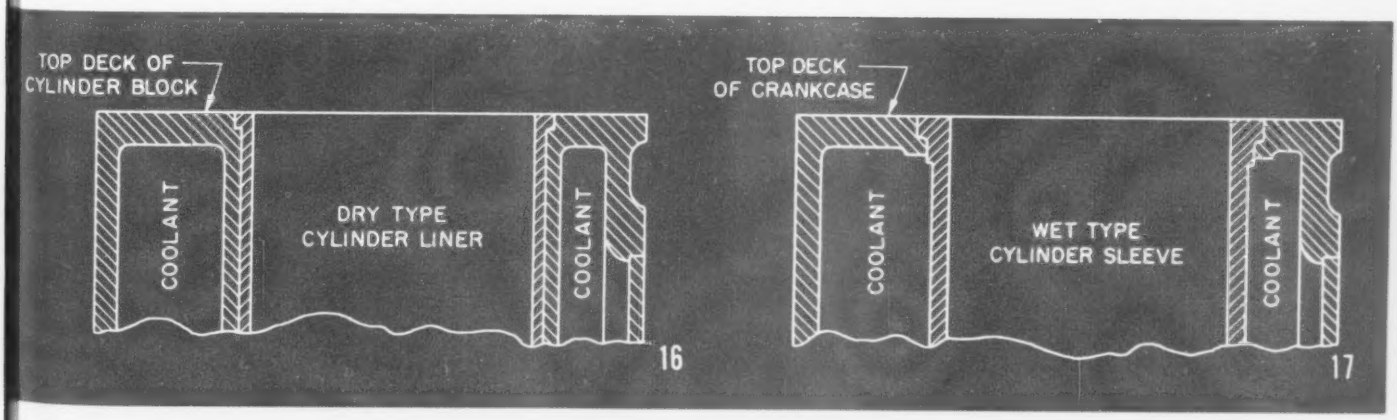


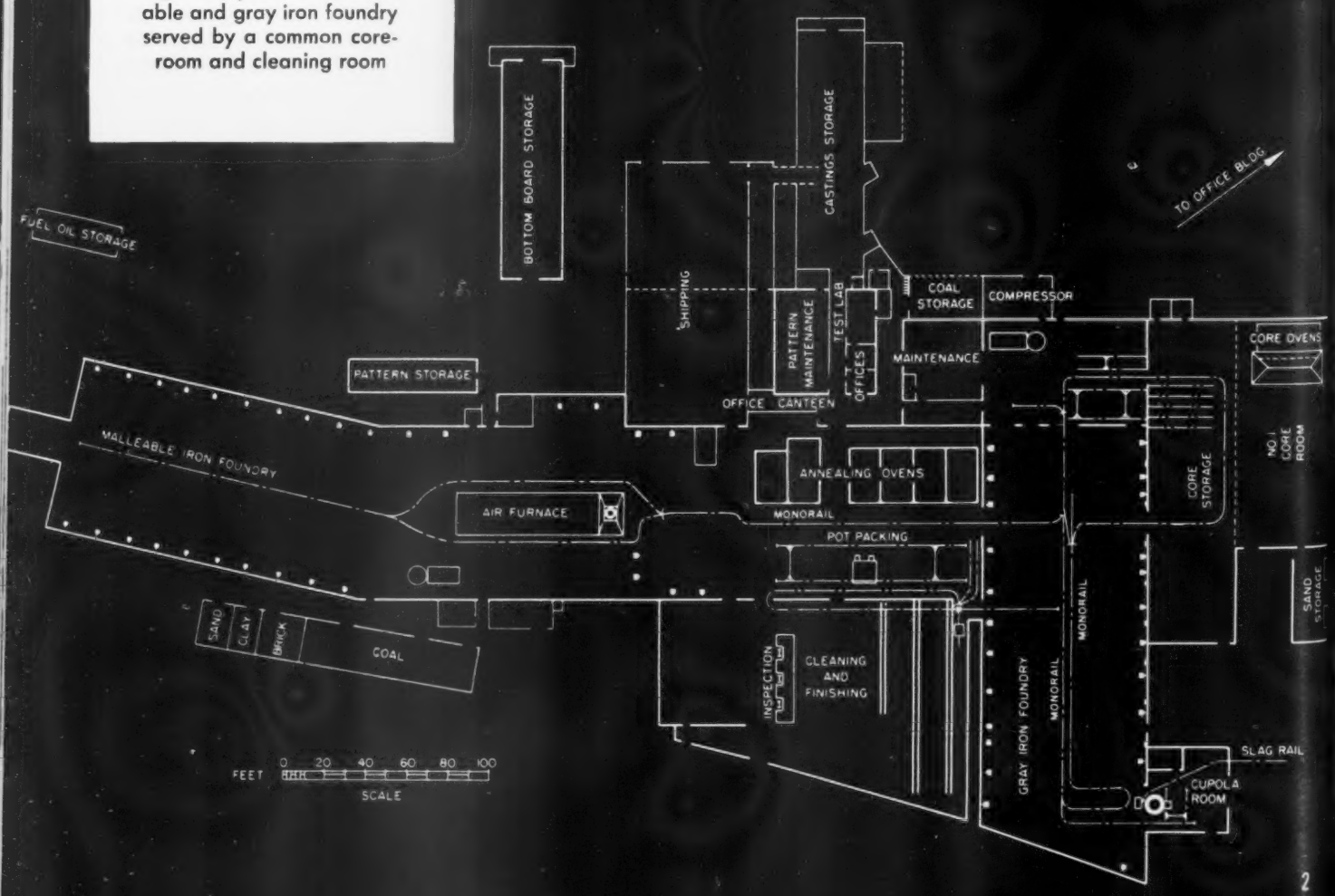
Fig. 16—Showing how dry cylinder liner is assembled in cylinder block. Liner not in contact with coolant

Fig. 17—Assembly of wet type cylinder sleeve in the crankcase. Coolant is in direct contact with sleeve

Modernizatio

Fig. 1 — This foundry is operated as a typical, one-heat shop. The molders pour their own floors

Fig. 2—Layout of a malleable and gray iron foundry served by a common core-room and cleaning room



Without Mechanization

This article, describing a completely modern foundry employing only limited mechanization, was presented before the 1951 International Foundry Congress in Brussels. On previous European visits the author was impressed by the fact many foundries were attempting to mechanize to a degree which was economically unsound, resulting in higher costs and less flexible operations. The article points out how various operations can be modernized without complete mechanization

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INTEREST is increasing throughout the world in more modern foundry operations. Often this desire for modernization results in mechanization that does not fit the local conditions; this, of course, is disastrous financially. However, to the best of the author's knowledge there is no exact limitation of tonnage, only, for modern and mechanized foundry operations. There are gray iron foundries pouring as little as 18 tons per day, and nonferrous precision foundries pouring as little as 3 tons per day—all highly mechanized and very successful. To achieve this successful result in any modern foundry it is necessary to analyze carefully many factors which determine the degree of mechanization that is economically justified. Nevertheless, all foundries may be modernized to permit greater production per man-hour with resultant increased earnings for workers and management, and a higher return to the owners.

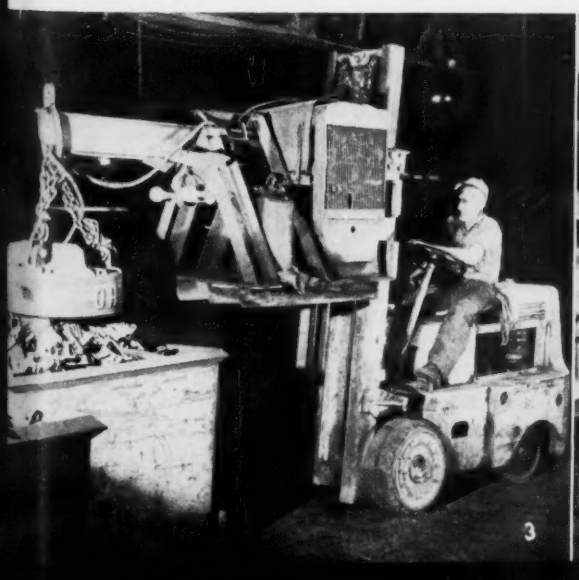
To achieve a modern foundry operation it is essential to reduce manual handling to a minimum, eliminate interferences to production and provide an incentive to produce. Modern foundry operation demands increased skill in management and supervision to plan the jobs for maximum productivity per man-hour of effort. The question then may be, "How can I modernize my foundry?" Since the author has been in some 1600 foundries in the United States and Canada and many in Europe and England without finding two presenting identical problems, he can say there is no general formula for achieving the end result.

The following discussion of local conditions, methods, facilities and results in a midwestern foundry illustrates a modern, successful operation without mechanization. As in any operating foundry which developed and expanded over a period of years without careful preplanning, there are improvements that can be made in layout, facilities and methods. However, the operating results in this plant are so successful that it is worthy of analysis and as a basis for comparison.

This foundry, as shown on Fig. 2, (a schematic plant view) consists of a malleable and gray iron foundry operation served by a common core and cleaning room, but with separate melting, molding and sand conditioning facilities. Based upon June, 1951 operation, the average castings weight was 3½ lb for malleable, 4½ lb for gray iron. The accompanying table on page 115 illustrates the man-hours per net ton of good castings for each department in each foundry, exclusive of

Fig. 3—Lift truck is used to deliver castings to cleaning room, sprue to charge make-up area

Fig. 4—Malleable air furnace is fired with powdered coal. Monorail crane handles metal charging



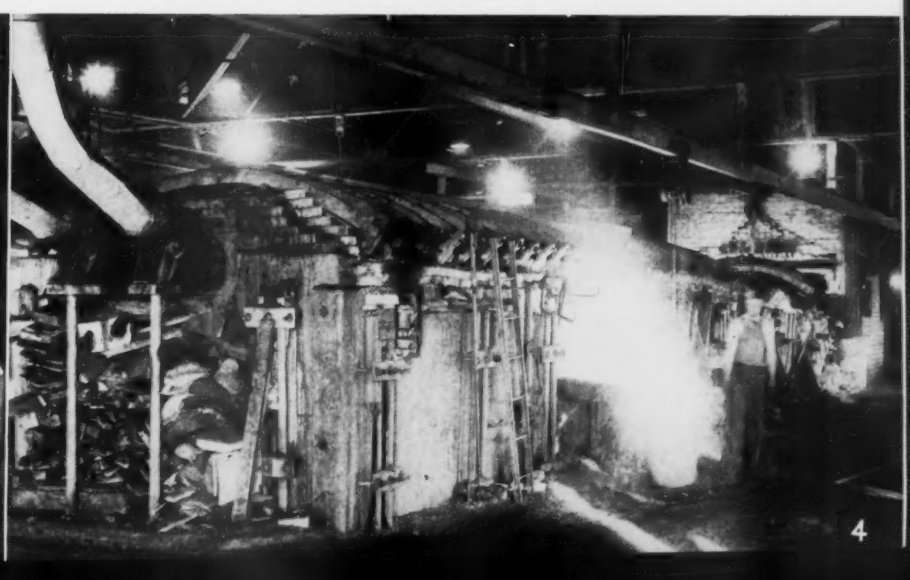


Fig. 5—Truck equipped with scoop is used to deliver sand from the floor to receiving hopper of a screening and magnetic separator unit (Fig. 6)

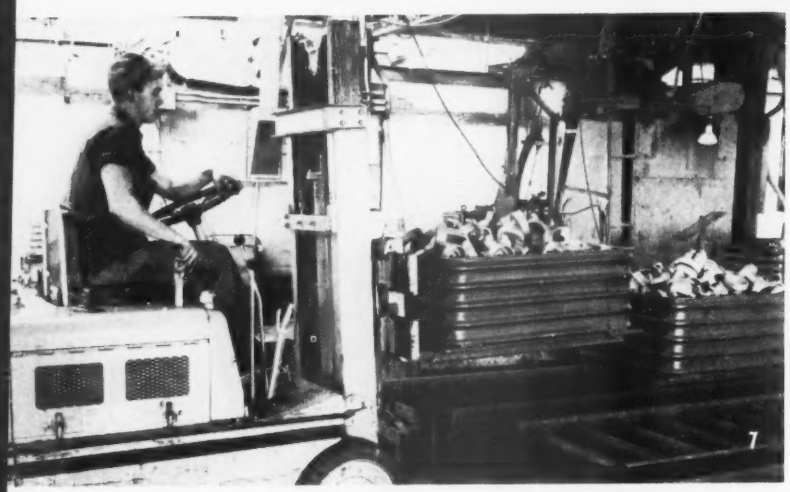


Fig. 7—Castings are transferred to the foundry cleaning room in dump buckets. These are handled either on a monorail or by a lift truck

Fig. 8—One of three airless blast units used to clean gray iron and malleable iron castings

supervisory and executive personnel. As may be noted, the malleable production was accomplished with 47.4 man-hours per ton and the gray iron with 28 man-hours per ton.

This foundry has consistently accomplished an engineering selling job, which selects, in so far as is practicable, the class of work best suited to its facilities and methods. The average condition requires approximately 1 lb of cores to 4 lb of castings. A detailed cost system aids in selling at prices that will result in profitable operations. It is impossible to operate a modern foundry without an adequate cost system with proper allocation of costs to various classes of work so that each price is commensurate with the amount of work on the casting.

All work is on incentive. However, it is a piecerate system of long standing which was established largely by barter between men and supervisors. While new rates are established by standards developed by time study, there are still inequities resulting from the old method, which was seldom fair either to labor or management. Average earnings in the plant are approximately $1.87 per hour. The minimum is $1.30, the maximum $2.55. The average malleable production is approximately 25 tons per day for 23 molders. The average gray iron production is 30 tons per day for 26 molders.

As may be noted from Fig. 1 the foundry is operated as a typical, one heat, manual, "floor" shop. The molders mold for 6½ hours and pour their own floors. A night crew shakes out, sprues, conditions the sand and cleans up.

Raw materials are received by truck or railroad car, unloaded by crawler crane, and piled on the ground adjacent to the cupola and air furnace. A lift truck with detachable magnet rig (Fig. 3) is used to load the castings and sprue into dump hoppers for delivery to the cleaning room and charge

LABOR DISTRIBUTION

Account Number	Account Name	Man-Hours — Per Net Ton — Malleable	Gray Iron
	Melting:		
11	Furnace & Cupola	..	0.4
12	Chargers	0.7	..
13	Repairmen	0.8	0.2
14	Laborers	1.0	1.9
	Total	2.5	2.5
	Molding:		
20	Direct	9.7	7.7
	Total	9.7	7.7
	Melting:		
41	Indirect, Iron Carrier	0.7	0.5
43	Ladle Liner	0.5	0.2
	Total	1.2	0.7
46	*Pattern & Flask:*	1.0	0.4
	Total	1.0	0.4
	Foundry Labor:		
51	Board & Band	0.3	0.2
52	Chill	0.3	..
53	Shift & Dump	3.7	1.8
54	Laborer	0.8	0.4
55	Shakeout & Breakout	2.2	1.6
56	Sand Cutter	0.2	0.2
57	Facing Mixer	0.3	0.2
58	Ind. Truck Operator	0.7	0.7
59	Sand Cutter Operator	0.2	0.1
	Total	8.7	5.2
	Hard Iron Cleaning:		
72	Blast	0.4	..
82	Inspectors	1.4	..
91	Grinding—Direct	2.7	0.9
101	Grinding—Indirect Gate Removal	0.3	0.3
	Total	4.8	1.2
	Annealing:		
110	Pots & Bottoms	1.8	..
122	Annealing Labor	1.6	..
122	Oven Oper. & Repair	1.1	..
	Total	4.5	..
	Soft Iron Cleaning:		
131	Tumbling Mill Oper.	0.1	..
132	Blast	0.4	0.5
	Total	0.5	0.5

Account Number	Account Name	Man-Hours — Per Net Ton — Malleable	Gray Iron
	Finishing:		
141	Chipper, Air Hammer	0.2	0.2
142	Straightener	0.3	..
143	Elec. Weld. Castings	..	0.5
144	Drill Press	0.1	0.1
	Total	0.6	0.8
	Sorting & Shipping, Regular:		
151	Inspect & Bench	2.1	1.4
152	Truckers	0.4	0.6
153		0.6	0.4
155	Ind. Truck Operator	0.2	0.2
	Total	3.3	2.6
	Sorting & Shipping, R.R.:		
161	Inspect, Finish & Trucking Brakeheads	1.1	..
162	Struts	0.5	..
	Total	1.6	..
	Miscellaneous:		
171	Yard Labor & Janitor	0.3	0.1
	Total	0.3	0.1
	Maintenance:		
181	Mach'y. & Equipment	1.0	0.8
183	Buildings	0.2	0.1
184	M. & E. Unallocated	0.6	0.5
	Total	1.8	1.4
191	Construction	.7	..
200	Supervision	.7	.6
210	Factory Clerks	.4	.2
	Total	1.8	0.8
	Core Room:		
3–11	Direct, Malleable	2.8	..
3–12	Direct, Gray Iron	..	1.9
3–21	Indirect, Oven	0.1	0.1
3–22	Pasting	0.1	0.1
3–23	Wheeling	0.2	0.2
3–24	Laborer	0.1	0.1
3–25	Sand Mixer	0.1	0.1
3–26	Chills	0.6	0.6
3–27		1.1	1.0
	Total	5.1	4.1
	GRAND TOTAL	47.4	28.0
	Average weight per casting	3¼ lb	4½ lb

Fig. 9—Snagging a finned engine casting on stand grinder in cleaning department

Fig. 10—Cleaned castings are placed in boxes for eventual delivery to chippers and grinders

make-up area, respectively. Materials for the charge are manually loaded into wheelbarrows, weighed on a floor scale and dumped into a skip hoist charger serving one No. 6 cupola. The malleable furnace (Fig. 4) is conventional, powdered coal fired, and is charged with boxes of metal with monorail crane.

The cupola is equipped with air—weight control and a positive displacement blower. Charges consist of 60 lb silvery pig, 440 lb regular pig, 500 lb steel, 600 lb sprue and 400 lb scrap (totaling 2000 lb). Approximately 270-lb coke splits are used, resulting in a coke-to-metal ratio of 7.4 to 1 (excluding bed coke). The cupola is front slagged into a bucket on a monorail and water is sprayed on the slag to cool and disintegrate it. Metal is tapped continuously for approximately 4¾ hours into a forehearth at a rate of approximately 11 tons per hour.

Three bull ladles of approximately 600 lb capacity are used to distribute the metal by monorail to the floors where it is poured into 250-300 lb capacity pouring ladles mounted in pouring devices suspended from monorail cranes. No molds are poured from hand shank ladles. Each molder pours his molds. Chill tests are made at 15-minute intervals and the metal alloyed or inoculated, as required. Molders also dump the molds and stack their bottom boards. More modern practice would be to provide a separate pouring crew to pour, shift and dump the molds. Experience in other foundries indicates a minimum increase of 30 per cent per molder in number of molds when the fatigue of pouring is eliminated. Such practice is under consideration at this plant.

The malleable heat is poured more rapidly. Metal is distributed in 600-lb ladles on monorail and poured to pouring ladles of 250 lb capacity in pouring devices on monorail or into hand shanks for very light castings. Unless the heat were (*Please turn to page* 206)

Fig. 11—Pot packing unit where annealed castings are shaken out. Ventilated booth cuts dust, heat

By HAROLD J. ROAST
Consulting Metallurgist

A Reliable Leaded Bronze

Long and successful experience with the alloy ASTM B30-49 (3D) plus 3 per cent zinc prompts the author to recommend it for bearings and castings required to resist corrosion and internal pressure. Melting practice in the alloy's use are discussed

AN ALLOY that can be relied upon to give good results for bearings, anticorrosion and pressure work up to 1000 psi, is worthy of adoption as one of the regular alloys to be used in the foundry. If, in addition, it is almost foolproof from the casting point of view, so much the better.

Such an alloy is ASTM B30-49 (3D) plus 3 per cent zinc. The addition of the zinc is essential and, up to the amount stated, is not detrimental in any way. The composition in per cent is tin 7, lead 15, zinc 3, copper remainder. It should be deoxidized with about 4 oz of 15 per cent phosphor copper for every 200 lb of metal, providing this leaves not more than 0.01 per cent phosphorus nor less than 0.005 per cent in the finished product. The amount will vary according to the melting conditions prevailing in the foundry. The metal should be poured at 1900° F whenever conditions permit.

The physical characteristics of this alloy statically cast in sand, may be safely taken as:

Yield strength	16,000 psi
Ultimate strength	26,000 psi
Elongation, % in 2 in.	15
Izod shock resistance in ft lb	7
Brinell hardness	65
Deformation limit	13,000 psi
Electrical conductivity (% of annealed copper at 20° C)	12
Density, weight per cu in.	0.334 lb
Density, weight per cu ft	577 lb

Being a leaded bronze it should not be used for pressure or even other purposes where the temperature under conditions of use is higher than 550° F. Also on account of its lead content, it should not be used where it would come in contact with solid or liquid food materials.

Having made a very definite statement in the opening paragraph, it is well to give evidence of its accuracy. The writer has made many millions of pounds of this alloy over the last 25 years, employing it for the various purposes already stated as suited to its use.

Let us turn to specific cases. This alloy is used for bearings of railroad engines both in the United States and Canada. This in itself is an important evidence of its reliability. The writer has used it extensively for digestor castings and others in the pulp and paper industry. Here it is called upon to resist both sulphurous and sulphuric acid solutions and the scouring action of the pulp.

Regarding pressure work the writer has always used the following test for any new alloy recommended for this purpose. A bushing closed at one end is cast 2 in. ID × 4 in. OD × 6 in. high, the closed end being of the same cross section as the walls. This gives a wall thickness of 1 in. One-third inch of metal is removed from the outside and the same amount from the inside, leaving a closed bushing of a wall thickness composed of the center third of the cast metal. A suitable thickness is left for a distance of say 1 in. at the open end to permit threading for the pressure connection. In such a form the leaded alloy was submitted to a hydraulic pressure test of 1000 psi and was found to be completely pressure-tight. At this point a slight increase in the outside diameter in the middle of the length of the casting was noted, but upon release of the pressure the bushing returned to its original size.

Another instance of the suitability of this alloy for pressure work came to the attention of the writer during the last war, when a "secret device" was required to be made. This casting had given a great deal of trouble both in England and Canada. It was required to be pressure-tight as tested by 60 psi air pressure, under water. If one pinhead of air appeared anywhere on the submerged casting, even if it did not rise to the surface, the casting was rejected. The test was conducted by submerging the casting in a large glass container of water, brilliantly illuminated.

The casting was of ring shape 15¾ in. × 16½ in. OD and 5¼ in. high. After machining the ID was 16 in. while the outside was just cleaned up. This left a little less than ¼-in. wall thickness. A part of the casting was threaded, leaving only ⅛-in. wall thickness at the base of the threads. To further complicate matters there were three heavy bosses, evenly spaced around the circumference, about 1¼ in. diameter and protruding from the wall about 1 in. This meant a very abrupt change in cross section. Gun metal had been tried without success.

Castings were made of the leaded alloy in green sand molds. No risers were used. The test casting was machined on the outside wall until all the bosses had been removed and the outside cleaned up. The casting was machined inside and threaded, and then submitted for test. There were no leaks in the test casting nor in several hundred made subsequently.

Also in connection with war work 2-in. valves were made in the leaded bronze (*Please turn to page* 200)

QUESTIONS and A

Soil Pipe Fittings May Leak

Q.—Can you give me the address of manufacturers in the United States who make equipment for molding and casting soil pipe accessories. We make these castings in 2, 3 and 4 in. inside diameters. We wish to sell them accompanied with a guarantee that they will not leak or show any other form of defect.

A.—The castings to which you refer are known in this country as fittings. So far as we know, all the companies engaged in the production of these castings make their own patterns and equipment. If a company does not operate a pattern shop, the contract for supplying these items is executed by an outside pattern shop, usually in the immediate vicinity. You do not state whether at present you are making the castings with green or dry sand cores. In this country mold and core are green sand. The subject has been covered in FOUNDRY many times. An unusually complete description of the practice in a prominent eastern foundry was presented in two parts in the June and July, 1946 issues.

Touching on the subject of leaking or otherwise defective castings, we might direct your attention to the fact that while good pattern and equipment are essential, they are not in themselves a guarantee of good castings. Many other factors are involved. Dry sand cores that are too hard, or not dried sufficiently, or contain too much binder, will cause agitation in the metal and consequently leaking or porous areas in the casting. Green sand cores that are rammed too hard, or contain excess moisture, or both, will produce the same result. Iron may be oxidized in the cupola with consequent gas holes in the castings.

Chain Block Raises the Doors

Q.—Several years ago we noted an illustration in FOUNDRY showing the charging floor of a gray iron foundry. The caption stated a chain block was employed every morning to pull up the cupola bottom doors. We shall appreciate further details on how the device is operated.

A.—The chain block is suspended from a hook attached to one of the roof beams directly above the charging door. A short eye bolt is fastened permanently in each half bottom door near the free edge and furnishes a ready means for hooking the lower end of a long light chain. The upper end embraces the hook on the chain block.

Assuming that the cupola lining has been chipped and daubed, the cupola attendant on the charging floor lowers the free end of the long chain through the door opening. The attendant on the ground floor inserts the hook in the eye bolt in one half door. The man on the charging floor pulls up on the hoist until the half door is jammed tightly against the cupola foundation plate. The first man wedges a steel bar under the half door near the center. He disengages the chain hook and transfers it to the eye bolt in the second half door. This is pulled up in a similar manner and propped in place. When the attendant descends into the cupola to ram the sand bottom, he releases the chain from the eye bolt. When he emerges later he pulls the chain out of the cupola and loops it to one side over a hook provided for the purpose.

Gas Holes in Bath Tub Bottoms

Q.—We are enclosing a sketch of a bath tub and a section of one, taken from the bottom, showing a defect being encountered. These holes always occur on the bottom of the tub or on the apron edge. Among many ideas as to the cause the most popular is that turbulence of the metal in pouring results in gas holes. The holes, which are not visible until the casting is shot blasted, do not conform to any definite pattern and are as likely to occur on the lower end of the bottom as the higher end of the bottom. About 75 per cent occur in the middle section of the bottom from end to end. We have tried numerous remedies —decreasing the pouring time (average pouring time for this tub is 4 seconds), skimmer gates, riddling the sand on the pattern, venting, risers, increased iron temperature, additions of ferrosilicon to ladle and cupola. Sand has a moisture content of 5 per cent, permeability of 75 to 90, and a green compression strength of 5.5 to 6.0 psi. Composition of the iron shows 3.40 per cent TC, 2.80 per cent Si, 0.70 per cent P, 0.1 per cent S, 0.2 per cent Mn, and the temperature 2660°F.

A.—Consideration of the defects shown in the sections of the casting you forwarded confirms your opinion that the holes are caused by gas. That is, the defects are the result of something in the molding sand. We do not believe that it is moisture, since blows from steam or water vapor usually are dull and discolored, while practically all of the interiors of the holes shown are bright and shiny. It is our opinion that the sand contains some organic material such as leaf mold, fine roots, etc., which burn in contact with the molten metal. If you were using seacoal—a practice not in vogue in enamelware shops—we would say that too much was being used. Again, if the defects were small pear-shape holes just under the skin, the trouble might be attributed to gassed metal.

You do not mention it, but we assume that occurrence of these defects is of recent origin, and that there has been no change in gating methods, etc.

Answers

Hence, it does not appear logical that turbulence might be the cause, although it should not be overlooked. One point that may have a bearing on the defects is the fact that they generally show at the top of the casting as poured—and that is the area where, at least theoretically, the streams of metal from the three sprues meet. Also in that area the metal should have lost considerable heat from its travel from the entering points and up the mold walls. In other words, a good place for cold shuts to appear, and we wonder whether this occurred when you decreased the pouring rate—and we assume the latter was accomplished by choking the sprues. If the slowing down was done by decreasing the flow from the ladle, you probably had other trouble due to the sprue not being kept filled. Use of a strainer core in the sprue would act as a choke since it reduces the effective area of the sprue.

While you indicate a considerable number of changes in practice to try to overcome the trouble, you unfortunately did not mention what occurred with each specific one—that is, whether it increased or decreased the prevalence of the defects or changed the location of them. Possibly some of that information might provide a key to the situation. Apparently the only thing you have not tried is increasing the gate or runner size to speed up pouring, although it appears that 300 lb or more in 4 seconds is rapid enough. We do not believe that the composition of the iron has any bearing on the problem, but as a matter of protection against iron sulphide formation which might lead to hard or brittle areas, manganese should be at least 0.35 per cent instead of the 0.2 per cent as at present.

Manganese Additions to Copper

Q.—Can you give us any information on the effect of manganese on copper-base alloys?

A.—Not much information on the effect of manganese on copper-base alloys appears in the literature. At one time, manganese-copper (30 per cent Mn) was used to a great extent as a deoxidizer for copper-base alloys, particularly in gun metal (88-10-2). Amount used was 0.25 to 0.50 per cent, or 4 to 8 oz per 100 lb. The copper-manganese should be low in iron. Manganese is said to increase the strength and hardness of bronzes. Vickers in his book *Metals and Their Alloys* mentions use of manganese in bearings which were claimed to give excellent resistance to wear. Composition is given as 80 per cent Cu, 7 to 9 per cent manganese-copper (25 per cent Mn), 6 per cent Sn, and 5 per cent Zn.

In manganese bronze it is said that the Mn increases the amount of Fe that can be dissolved, increases tensile strength and resistance to corrosion and erosion. It improves elastic limit but reduces resistance to shock if present in any appreciable quantity. Primarily it is a deoxidizing agent, and when in excess its tendency to oxidize may cause trouble in castings due to oxide skin.

In aluminum bronze Mn acts similarly to Fe in that it refines the structure and gives enhanced physical properties. However, Fe is used in preference to Mn commercially. *Aluminum Bronze,* published by the Copper Development Association (Great Britain), states that the first 1 per cent addition of Mn increases tensile strength of 10 per cent aluminum bronze by 4.5 tons (10,080 lb) per sq in., but additional 1 per cent additions only increase tensile strength by 1 ton (2240 lb) per sq in. each.

Cupola Gives Low Cost Melting

Q.—Can you give us any information on the advantages or disadvantages of an electric or gas furnace as compared to a cupola? We now are running the cupola 8 hours daily, melting 20 tons with continuous pouring. However, our labor problems seem to be increasing, and we would like to make a change if the cost would not be too prohibitive.

A.—Principal advantage of cupola melting over other methods is cost. For example, A. W. Gregg in an article, "Iron Melting Costs in the Cupola and Electric Furnace," in the February, 1949 issue of FOUNDRY gives a conversion cost (not including metal) in the

GANGWAY!

By J. A. PATTERSON

"Keep your shirt on. I said I was comin' around there, didn't I?"

cupola of about $5.39 per ton and for the electric furnace a cost of $10.61 or almost double. Both are for melting 60 tons per day.

In an article in the April, 1948 issue, "Valve Manufacturer Expands Operations," by J. C. Sullivan, costs for a gas-fired reverberatory type melting gray iron are given as 0.3 cents per pound including gas, labor and lining costs for a 1200-lb unit producing six heats in 8 hours. Other data are that gas consumption averages 9600 cu ft per ton, patching begins at 45 tons, and relining at 90 tons. Another type gas-fired furnace mentioned in the July, 1951 issue (page 149) shows with reference to a 1000-lb capacity unit, a consumption of 3100 cu ft of gas per 21-minute heat, and a lining cost of 60 cents per heat.

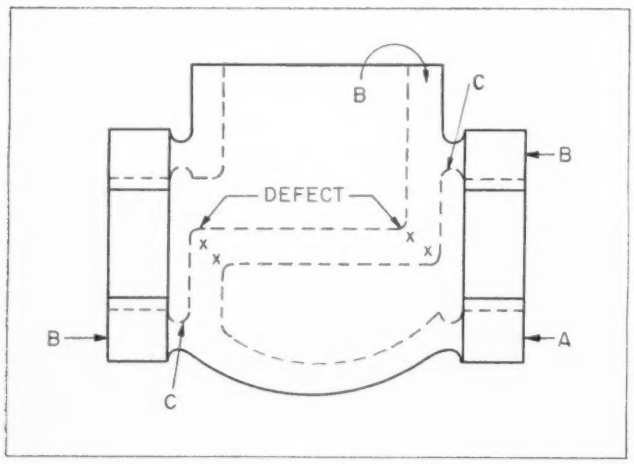
If your problem is one essentially of labor for charging the cupola, changing to another type of melting will not be a solution since you still will require a charging force. It appears to us that installation of mechanical charging equipment on your cupola would alleviate some of the difficulties at that point.

Heavier Section Needs Feeding

Q.—We are sending you some sectioned bronze globe valves, ¾-in. size, with which we are having considerable difficulty. You will note the coarse, yellowish structure at the junction of seat and body in all specimens as well as small holes in some. Can you tell us the cause, and how we can eliminate the trouble?

A.—The defect exhibited by the specimens results from lack of feed, and can be corrected by changing the method of gating the casting. Examination of the castings indicates that at present the gate is attached at the point marked *A* in the accompanying sketch, and the body of the valve freezes or solidifies before the slightly heavier seat section. We believe that the trouble can be eliminated by changing the point of entry of the metal to any of the points marked *B* in the sketch, since metal then is fed directly into the seat section in the inside center.

You may have to thicken the sections marked *C* if gated into them, so as to prevent any possibility of "freezing off" due to the metal section being thinner than in adjoining parts. Runner from the sprue should be placed all in the cope. Feeder from runner to casting should be as short as possible.



Gating into *A* results in lack of feed into seat section. Gating into *B* should overcome trouble

Use of Cement Sand for Cores

Q.—Could you advise us as to where we could obtain information regarding the cement molding and core process; the materials and their proper uses? We would like to experiment particularly with cores. What are its advantages and disadvantages?

A.—If you have available the September and October, 1950 issues of FOUNDRY, you will find detailed information relative to use of cement as a bond for molds and cores in a series of articles by J. H. Hall. While they deal with steel castings, they also will apply to gray iron.

Hall points out that advantages include lack of distortion in molds and cores, since they do not have to be handled or heated; no ovens or driers are required, and flasks are not needed. Disadvantages are that the sand mix must be used within 3 hours; new sand facing always is required; it is not good for castings of such form that the mold restricts contraction; mold must set 72 hours before use. Cement bonded sand is not good for small cores, due to moisture content and the fact that they are difficult to extract from the casting.

Sand used for molds and cores is 45 to 55 AFS grain fineness and clay-free. Mixture is composed of 100 lb sand, 13 lb high-strength cement and 5 per cent moisture. In hot weather moisture is increased, but not over 8 per cent. Backing sand may be composed of crushed old cement-bonded sand 100 lb, cement 10 lb, and 7 per cent moisture. For large cores the face would be new sand mix and the interior made of backing mix.

Centrifugal Casting of Liners

Q.—We operate a foundry in Spain and make a 6-hp water-cooled diesel engine for which we want to cast cylinder sleeves or liners. We are enclosing a drawing showing the finished dimensions and would like to have some suggestions on iron composition, speed, outline and protective coating for the metal mold.

A.—The drawing you enclose shows the upper flange to be 130 mm OD, and the lower end 116 mm OD, the bore 100 mm, and the length 260 mm. If good melting practice is employed to obtain clean, hot iron, we believe that you can obtain the desired final dimensions from a rough, centrifugally poured casting with its OD dimensions increased 5 mm, the length increased 5 mm, and the bore decreased by a like amount. That is, the flange should be 135 mm, the length 265 mm, and the bore 95 mm. However, the exact allowance for machining and grinding will have to be determined by experiment. If the allowance in-

(*Concluded on page* 122)

The *Improved* ROYER COMBINATION with MAGNETIC SEPARATION added...

for Complete Proper Sand Conditioning

Magnetic separation is an additional feature in the new model Royer Combination Scrap Remover and Sand Separator-Blender. In this complete sand conditioning unit, used sand is fed into the hopper and goes through the Scrap Remover where burned cores, gaggers and heavy scrap are removed. By means of a conveyor belt it then passes over a magnetic pulley—a new addition to this equipment—where small scrap, shot and fines are eliminated . . . sand is then free of all contamination. Following this *double* refuse removal, the sand is given the Royer 6-point sand conditioning and is discharged thoroughly prepared, aerated and blended . . . ready for the molder's use. Model NDC-M with a capacity of 20 to 25 tons per hour is illustrated. Also available in 30 to 50 tons capacity.

Ask for the facts on Royer machines for proper sand preparation. Our engineers are available to assist you in the selection of the correct equipment for your needs.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

QUESTIONS *and Answers*

(*Concluded from page* 120)

dicated is not enough, it always is easy to increase the size of the mold cavity, and decrease the size of the hole in the coverplate.

With the mold rotating on a horizontal axis the speed probably should be about 1000 rpm, and if it rotates at an angle of 30° from the horizontal it might be about 800 rpm. Best operating speed should be determined experimentally. Mold surface can be protected by a thin refractory clay wash. Wash should be applied when the mold is just warm enough to cause immediate drying, but not hot enough to cause boiling and resultant pinholes or blisters. Spraying is preferable to brushing on the wash since it permits thinner and more uniform coats.

A wide range of compositions are used in this country for cylinder liners, and they usually contain Ni, Cr, Mo, etc., in various combinations. For example, one shows 0.60 to 0.70 per cent Mo and 0.40 to 0.50 per cent Cr, and another 1.80 to 2.20 per cent Ni with 0.55 to 0.75 per cent Cr. A large number of compositions may be found in the *Alloy Cast Iron Handbook* published by the American Foundrymen's Society.

As-cast liners usually are heat treated or annealed at 1000 to 1100°F to relieve stresses and increase machinability. Following machining they are heat treated, quenched and drawn. Heat treating temperature will vary according to composition and may be in the range 1540 to 1560°F for 30 to 40 minutes for a ⅜-in. section. Quenched in still oil, the brinell hardness will be not less than 512 or the Rockwell hardness C 52. Drawing is at 350 to 370°F for 2 hours.

Light on Properties of Sand

Q.—We have no really high grade molding sand in our district and have to do the best we can with what is available. We would like to have an assay made of samples recently submitted, but do not know what chemical or physical properties should be determined. Can you outline for us the elements of a good grade of sand suitable for brass and bronze castings?

A.—The sand subject is so vast and presents so many ramifications that it is impossible to cover it satisfactorily in a few words. There is no such thing as one definite standard sand. Sands from widely separated deposits and showing wide divergence in chemical and physical properties and composition, serve satisfactorily for molding identical castings. For that reason a chemical analysis is not of much service as a guide. The elements to be looked for include permeability, bond, grain size and shape, green and dry compression strength, and moisture content. Marked variation in any of these elements will affect the value of the sand. Through many years the American Foundrymen's Society has developed a number of standard tests and has published a book on testing and grading foundry sands.

Making Cupola Slag Analysis

Q.—Our foundry chemical laboratory which is capable of complete chemical analysis of gray iron, is contemplating beginning the analysis of slag. Just how much control can be achieved from complete analysis of slag?

A.—While most progressive foundry operators are cognizant that the slag has an effect on melting in the cupola, at present there is no detailed published information on control tests and procedures. Some general information on slags and fluxes is given in the *Handbook of Cupola Operation.*

Chemical analysis of slag, due to the time required, would be more of a "post-mortem" than of immediate value. Other tests—such as color, surface appearance, possibly fracture, fluidity or flow—would be more pertinent since they can be made on the spot. Of course, considerable experimental work would be involved to set up standards or perhaps limiting ranges since the slag condition would have to be tied in with satisfactory iron in regard to composition, temperature, melting rate, cleanliness, etc.

Add Coal Dust to Facing Sand

Q.—We shall appreciate information on the best mold facing mixtures which will make our small gray iron castings come clean with the least possible amount of sand or parting compound sticking to them.

A.—Highly refractory sand with minimum clay content will strip clean from small gray iron castings. As the clay content increases the refractoriness is lowered and some of the sand sticks or fuses to the casting surface. With high clay content the fusing effect is more pronounced. The high refractory, low clay content sand needs no special treatment.

The ordinary grades of molding sand will strip clean if they contain 6 to 8 per cent seacoal. In some instances the entire sand heap is treated with seacoal. In the majority of instances the coal is added to a small amount of sand. In some cases pulverized pitch is added instead of coal. This special or facing sand is used to cover the pattern in a thin layer. After the pattern is drawn out of the sand the molder shakes a thin film of plumbago, mineral blacking, silica or talc through a bag and onto the mold face.

Permanent Molds for Aluminum

Q.—Please send us a list of recent publications on aluminum permanent molding foundry practice.

A.—A few years ago the American Foundrymen's Society, 616 South Michigan Ave., Chicago 5, Ill., published a *Permanent Mold Bibliography* which listed all the pertinent articles on the subject. You will find it of interest and it may be obtained for $3.

Articles appearing in FOUNDRY on the subject the last few years include: "Permanent Mold Casting of Aluminum" by Bremer, November, 1947; "Aluminum Alloy Castings" by Lewis, July, 1948; "Casting Aluminum Pistons in Permanent Molds" by Herrmann, September, 1948; "Permanent Mold Casting of Aluminum Engine Blocks," December, 1950.

PROGRESS REPORT ON NATIONAL CARBON
TRADE-MARK
BLAST FURNACE LININGS

33 BLAST FURNACES lined with "NATIONAL" carbon have now produced over 1 million tons. Of these, 12 furnaces have produced more than 1½ million tons and 4 have passed the 2 million ton mark.

These tonnages are for *original linings*. In every case, production has been characterized by remarkably trouble-free operation.

The term "National" is a registered trade-mark of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
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District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
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BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • SKIMMER BLOCKS • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS • TANK HEATERS

MEN

of Industry

ALFRED L. BOEGEHOLD has been appointed assistant to general manager of General Motors Research Laboratories, Detroit, succeeding **E. V. Rippingille Sr.,** who, following retirement, will be retained as a consultant. **Dr. Robert F. Thomson** has been named head of the research metallurgy department. Mr. Boegehold was graduated from Cornell University and joined the GM research staff in 1920, becoming head of the metallurgy department in 1925. He is a past president of the American Society for Metals, and in 1942 was awarded the J. H. Whiting Gold Medal of the American Foundrymen's Society. Dr. Thomson was graduated from University of Michigan in 1937 and for two years was with Republic Steel Corp., Chicago. Following graduate work at his alma mater he served with the Dodge Chicago Plant's foundries, subsequently joining International Nickel Co. He was appointed assistant head of GMC's research metallurgy department in 1950.

♦ ♦ ♦

Edward J. Metzger has purchased the Multi-Cast Corp., Wauseon, O. The company, a producer of aluminum and bronze castings, was formed in 1946 by **Floyd Ensign,** well known Toledo foundryman, who is retiring from the company after many years in the industry. **Thomas O'Neil,** recently vice president of Multi-Cast, continues as assistant manager. For the last year Mr. Metzger has been with the Office of Price Stabilization, Washington—lately as chief of the Castings and Forgings Section—and will retain an advisory connection with that agency. Before going to Washington he was plant manager, Wellman Bronze & Aluminum Co., Cleveland, and previously was foundry and machine shop superintendent, Falcon Bronze Co., Youngstown, O. The Multi-Cast Corp., with a monthly single-shift capacity of 100,000 pounds of castings weighing up to 1 ton, will specialize in producing heat treated aluminum alloys, aluminum and beryllium bronzes and copper-nickel alloys.

♦ ♦ ♦

Clyde L. Frear, until recently materials engineer in technical charge of castings for the Welding, Casting and Forging Branch, Bureau of Ships, Washington, has been named production engineer of the foundry and pattern shop, industrial engineering group, Management Planning and Review Branch of that bureau. Mr. Frear, a graduate of Syracuse University, and Queen's University, Ontario, after a period of teaching at Lehigh University was assistant professor of materials and metals at United States Naval Academy postgraduate school, Annapolis. Prior to joining Bureau of Ships in 1939, he served two years as metallurgical engineer in the foundry division, Kelsey-Hayes Wheel Co., Detroit, and held a similar position with Pitcairn Co., Pittsburgh Valve & Fittings Division, Barberton, O.

♦ ♦ ♦

J. C. Willey has been appointed assistant to the president, Harbison-Walker Refractories Co., Pittsburgh. Mr. Willey was graduated from Princeton University and joined the company in 1934. After operating and executive positions in several of its plants, he was transferred in 1947 to the Pittsburgh office where he served as assistant to the vice president.

♦ ♦ ♦

Vernen A. Tredinnick has been appointed works manager, Walworth Co., Kewanee, Ill., succeeding **W. G. Conner Jr.,** who has been named special production assistant to **Alfred J.**

(*Continued on page* 126)

ALFRED L. BOEGEHOLD
. . . General Motors Research

DR. ROBERT F. THOMSON
. . . metallurgy research, GMC

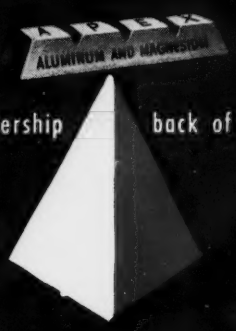
EDWARD J. METZGER
. . . acquires nonferrous foundry

CLYDE L. FREAR
. . . with Bureau of Ships

APEX

Z-50

aluminum alloy

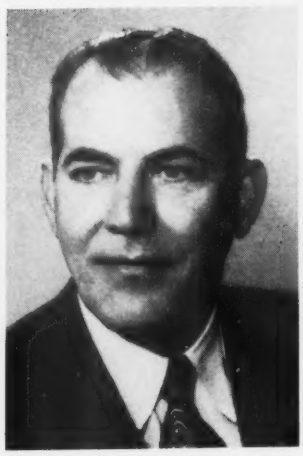


Research leadership back of every Ingot

APEX SMELTING COMPANY

EDWARD J. WALSH
. . . exec. secretary, NFA

CHARLES T. SHEEHAN
. . . joins NFA staff



L. J. CARSON
. . . returns to Link-Belt

O. JAY MYERS
. . . technical director, ADM

(*Continued from page* 124)

Eichler, recently elected president. Mr. Tredinnick has been associated with the Kewanee plant since 1926. He became superintendent of the finishing division in 1946 and production control manager two years later. Mr. Conner joined Kelly & Jones Co., Greensburg, Pa., in 1919, which later became a Walworth subsidiary. He has worked at the Greensburg plant and as a consultant at Kewanee, where he has been works manager since 1945.

♦ ♦ ♦

Edward J. Walsh has been appointed executive secretary, National Foundry Association, Chicago. Mr. Walsh was graduated from St. Mary's College, later taking graduate work in economics at Georgetown and Harvard Universities. He joined NFA in May, 1950. **Charles T. Sheehan,** a graduate of Loyola University in Chicago, recently joined the staff and will assist in the program of the association's activities.

♦ ♦ ♦

L. J. Carson has resigned as price executive of the machinery branch of the Industrial Materials and Manufactured Goods Division, OPS, Washington. Formerly general manager of Link-Belt Co.'s Minneapolis plant, Mr. Carson has been named general manager of its new plant under construction in Colmar, Pa. He was graduated from University of Pennsylvania and joined the engineering department of Link-Belt's San Francisco plant in 1935, later becoming chief engineer of the Pacific Division and chief engineer in Chicago.

♦ ♦ ♦

O. Jay Myers has been appointed to the newly created position of technical director, Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, in charge of research, new product development and manufacturing control. Mr. Myers was graduated from Princeton University and Colorado School of Mines. Since 1945 he has served as director of foundry research with Archer-Daniels-Midland Co. Prior to that he was associated with the Wright Aeronautical Corp., foundry, Lockland. **O. J. David Johnson** has succeeded Mr. Myers as director of foundry research for the Foundry Products Division. Mr. Johnson, a graduate of University of Minnesota, became a research engineer with the division in 1946.

♦ ♦ ♦

Phil Block has been named special sales representative in the Detroit area for Frederic B. Stevens Inc.'s foundry sales department. Mr. Block attended Detroit Institute of Technology and was previously associated with Michigan Steel Casting Co. there. He will represent the company in sale of its products, primarily to nonferrous foundries.

♦ ♦ ♦

Harry G. Schlichter has been named vice president in charge of sales and service, Beardsley & Piper Division, Pettibone Mulliken Corp. Mr. Schlichter entered the foundry industry in 1910 as a foundry apprentice with Henry E. Pridmore Co., Chicago, where he remained in the foundry 5 years. Subsequently he worked in the machine shop and engineering departments and as plant superintendent until he joined Beardsley & Piper in 1922 as sales engineer. He became sales manager in 1944.

♦ ♦ ♦

Roy W. P. Johnson, formerly in the Mount Vernon, O., plant of Cooper-Bessemer Corp., has been transferred to the company's New York office as sales engineer.

♦ ♦ ♦

Louis H. Heyl, vice president and general manager, Federal Foundry Supply Co., Cleveland, recently was elected president of the Foundry Facing Manufacturers' Association, succeeding Frank B. Flynn, vice president, S. Obermayer Co., Chicago. Mr. Heyl recently completed his 41st year with the Federal Foundry Supply Co., having started with that firm as a city salesman in 1910. Later he rep-

(*Continued on page* 129)

PHIL BLOCK
. . . foundry sales, Detroit

HARRY G. SCHLICHTER
. . . Beardsley & Piper sales

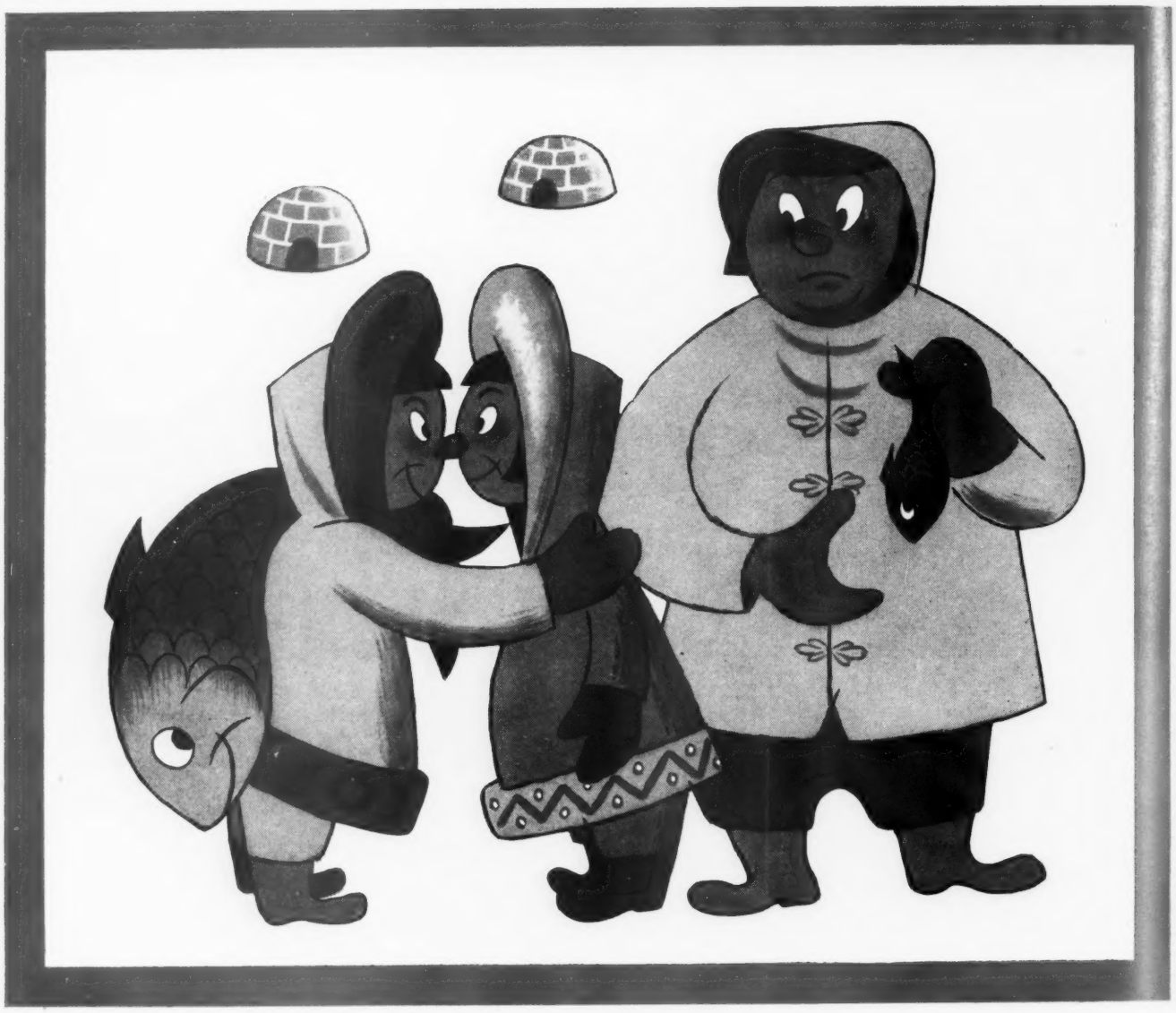
On the job!

Our volunteer speakers are saving thousands of lives *today* . . . in factories and business offices . . . at neighborhood and civic centers . . . at social, fraternal and service group meetings all over this land . . . by showing people what they can do to protect themselves and their families against death from cancer.

In laboratories and hospitals, from coast to coast, our volunteer dollars are supporting hundreds of research and clinical projects that will save countless more lives *tomorrow*.

To find out what you yourself can do about cancer, or if you want us to arrange a special educational program for your neighbors, fellow-workers or friends, just telephone the American Cancer Society office nearest you or address your letter to "Cancer" in care of your local Post Office. One of our volunteer or staff workers will be on the job to help you.

American Cancer Society



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For Maximum Foundry Efficiency . . . be sure to specify Penolyn Core Oil. There is a grade of Penolyn for Every Type of casting, to meet the most exacting requirements of every conceivable Foundry and Core Room Practice.

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- Uniformity
- Concentrated form
- No obnoxious odor
- No seepage
- No crusting of green mix
- Clean working
- Wide temperature baking range
- Polymerized formulation
- Minimum gas
- Ample collapsibility

PENOLA OIL COMPANY

NEW YORK • DETROIT • CHICAGO • ST. LOUIS

Penola

FOR EXPERT TECHNICAL ASSISTANCE — be sure to call the nearest Penola Office for any technical data or assistance you may need regarding your casting operations.

(*Continued from page* 126)

resented the company in Ohio, Indiana and Michigan. In 1918 he was made secretary of the company in charge of purchasing and sales, and later became vice president and general manager.

♦ ♦ ♦

Norman J. Dunbeck, formerly vice president, Eastern Clay Products Inc., Jackson, O., has been elected a vice president of International Minerals & Chemical Corp., Chicago, which recently acquired the former company. He will be in charge of a newly formed Industrial Minerals Division and will continue to supervise the Eastern Clay Products Department of the parent company. Mr. Dunbeck is a former national director of American Foundrymen's Society and a past chairman of Central Ohio Chapter of the AFS. **E. W. Claar** has been appointed manager of the Eastern Clay Products Department of the company. Mr. Claar was formerly central district manager of Eastern Clay Products Inc. His office will remain in Jackson, O. for the present. He is a director of the Central Ohio Chapter of the AFS. **Tom E. Barlow** continues as general sales manager with the department.

♦ ♦ ♦

Theodore M. Dillaway and **George B. Kellogg** have been elected assistant vice presidents, Buffalo Forge Co., Buffalo, N. Y. Mr. Dillaway, who attended University of Pennsylvania, joined the company in 1940 and has served in the credit, federal and marine engineering sales and machine tool sales departments. He has been assistant secretary of the company for several years. Mr. Kellogg attended Cornell University and joined the company's Buffalo Pumps factory in North Tonawanda, N. Y., in 1940. In 1942 he was transferred to production work in the Buffalo factory and recently has been assistant production manager there.

DR. FRANCIS C. FRARY
. . . leaves research laboratories

DR. KENT R. VAN HORN
. . . heads Alcoa laboratories

♦ ♦ ♦

Dr. Kent R. Van Horn has been named director of research at the Aluminum Research Laboratories of Aluminum Co. of America, New Kensington, Pa., succeeding **Dr. Francis C. Frary,** who has retired. Dr. Van Horn, who was graduated from Case Institute of Technology, completed postgraduate work at Yale University and joined Alcoa in 1929 as a research metallurgist at the Cleveland division of the Aluminum Research Laboratories. He became chief of the Cleveland research division in 1945, assistant director of research there in 1949 and two years later was named associate director of research at the New Kensington laboratory. Dr. Frary received his master's degree in science from University of Minnesota in 1906 and, following a year's study at University of Berlin, returned to his alma mater as assistant professor, receiving his Ph D degree in 1912. He joined Alcoa in 1918.

Edward R. Anderson has been named president of the American Forge Division, and **William E. Crocombe,** assistant to the chairman of American Brake Shoe Co., New York. Mr. Anderson, who joined the company in 1930 following graduation from Yale University, was formerly vice president of the Brake Shoe & Castings and Kellogg Divisions and has been located in San Francisco since 1941. Mr. Crocombe, for 28 years president of the American Forge Division, joined the company in 1915 and in addition to heading the American Forge Division, was president of the American Manganese Steel Division from 1933 to 1940.

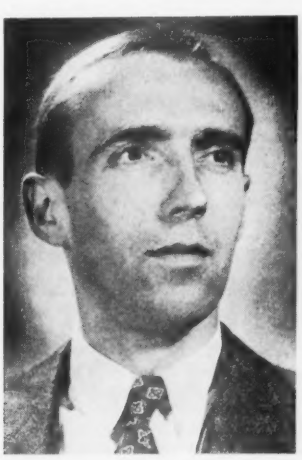
♦ ♦ ♦

W. H. Wise has been appointed director of sales, Bryant Heater Division of Affiliated Gas Equipment Inc., Cleveland, succeeding **J. N. Crawford,** who has been appointed assistant to the president of Affiliated Gas Equipment Inc. Mr. Crawford, a graduate of Case Institute of Technology, has been sales director for 7 years, as-

(*Concluded on page* 132)

NORMAN J. DUNBECK
. . . v.p., International Minerals

E. W. CLAAR
. . . Eastern Clay mgr.

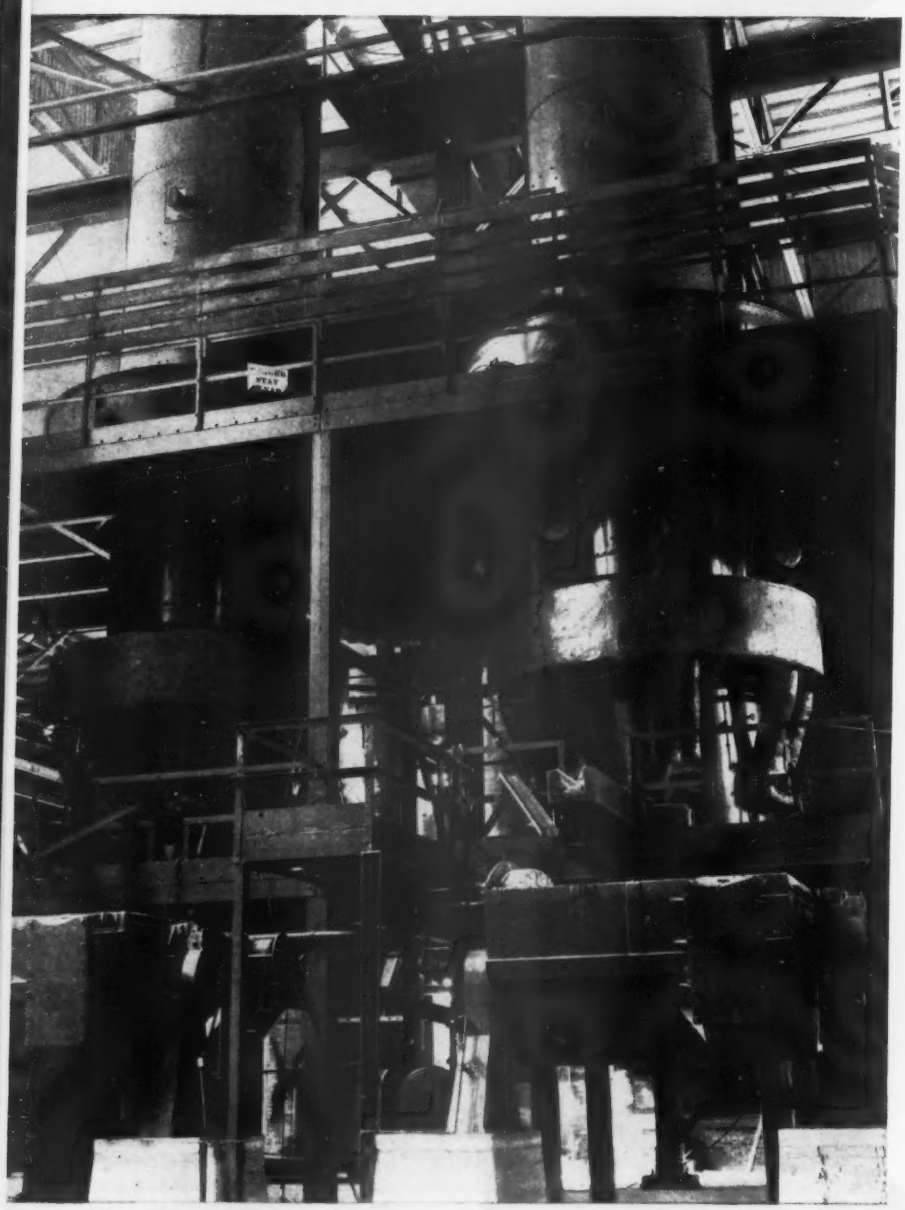


GEORGE B. KELLOGG
. . . Buffalo Forge executive

THEODORE M. DILLAWAY
. . . v. p., Buffalo Forge

AUTO SPECIALTIES BOOSTR

Cupola-to-Electric Furnace Melting Provides Continuous Metal Flow Plus Improved Controls



These two No. 9½ Whiting Cupolas operate in conjunction with an electric furnace to provide Auto Specialties with today's most effective method for increasing metal yield . . . *duplexing!*

A completely mechanized melting department enables Auto Specialties Mfg. Co., St. Joseph, Mich., to produce malleable castings on a production basis.

An important factor in their melting operations is the cupola-to-electric furnace duplexing system which not only provides a continuous supply of molten metal but also makes possible more uniform control of analysis and temperature.

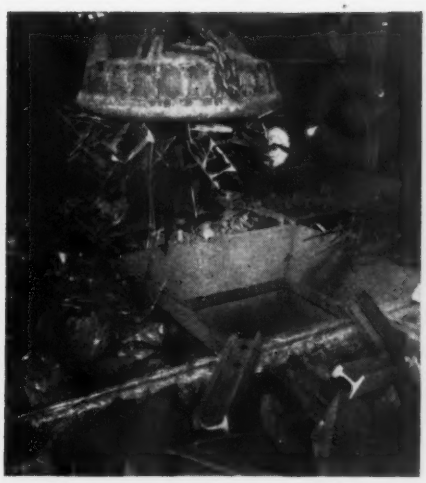
In the duplexing operation, two No. 9½ Whiting Cupolas are used alternately in conjunction with an electric furnace. These cupolas are equipped with Griffin Hot Blast and Kathabar moisture control. Through the use of the hot blast system, hot gases which would otherwise escape up the stack are drawn off and utilized to preheat the air. This process saves coke, speeds up the melting rate and improves control. Prior to pre-heating the blast, air is drawn through a Kathabar unit to insure a uniform moisture content throughout the year.

The combination of duplexing and hot blast has led to lower melting costs and better metallurgical practice. Analysis of iron is held to closer tolerances, melting losses are held to a minimum and the iron anneals more readily. Coke consumption has been considerably reduced and the coke to iron ratio is 1:10.

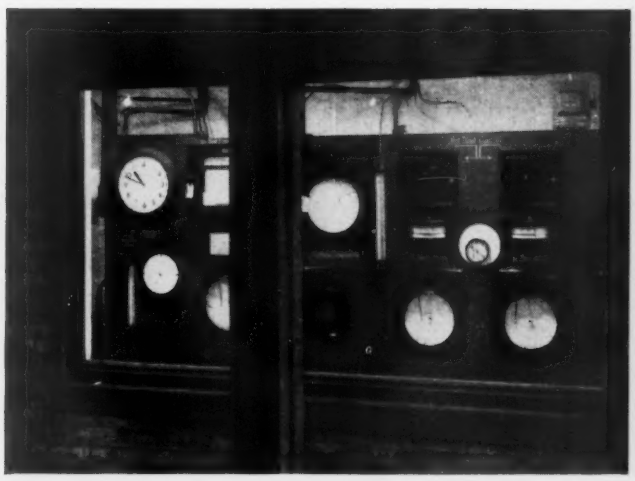
Other Whiting equipment used in this plant includes an iron loading platform with weigh hopper; coke and stone bins with weigh hopper and dust suppressor; cone-bottom buckets; electric transfer car; underslung charging crane for lifting the buckets to the wishbone at charging level, U-shaped mixing ladles; and a special car for removing cupola drop. All these make possible faster, more uniform and economical operation.

STRODUCTION WITH DUPLEXING!

Here, a Whiting Cone-Bottom ket is being brought to the cupola or charging. As it lowers, the one bottom is released slowly, allowing even distribution of the load within the cupola.



A view of the iron loading platform with batch weigh hopper, served by magnet crane.



The central control board at Auto Specialties is a clearly visible and accurate record of melting operations. Instruments record flow of air to the cupola, as well as moisture control and air temperature.

Whiting U-shaped mixing ladles receive hot metal continuously and at the same time fill the transfer ladle which transports the molten metal to an electric furnace for refining and superheating.

Let WHITING give you "Facts on Duplexing"

Write today for Whiting's new paper that gives complete information on duplexing. Ask for Bulletin No. FO-4.

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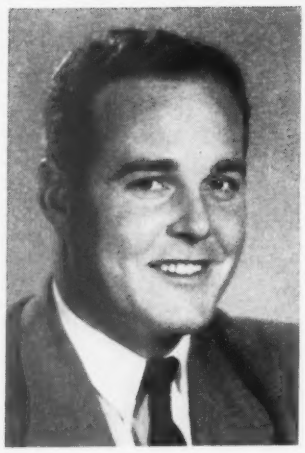
LON E. RUSSELL
. . . sales engineer, Dravo Corp.



GENE THOMAS
. . . Frank G. Hough sales

A. R. BARNETT
. . . heads fire brick sales

FRED FRIEDLIEB
. . . joins Admiral Die Casting

(*Concluded from page* 129)

sisted in the past year by Mr. Wise, who was midwestern sales manager before joining Bryant's headquarters sales staff.

♦ ♦ ♦

Lon E. Russell has been appointed sales engineer for the Dravo Corp. Machinery Division in the metropolitan New York territory. Mr. Russell, who attended University of Pittsburgh, will handle sales of the company's heaters and crane cab coolers with headquarters in the New York office.

♦ ♦ ♦

Gene Thomas has been appointed district representative, the Frank G. Hough Co., Libertyville, Ill., in the sales district covering Washington, Oregon, Idaho, Montana and Wyoming. Mr. Thomas was graduated from University of Illinois and has recently completed a training period of a year and a half with the Hough organization.

♦ ♦ ♦

A. R. Barnett has been named vice president in charge of sales, A. P. Green Fire Brick Co., Mexico, Mo. Mr. Barnett attended University of Illinois and has been associated with the company 28 years. He has had broad experience in sales, manufacturing, shipping and finance divisions of the company and has been general sales manager for almost 2 years.

♦ ♦ ♦

Fred Friedlieb, formerly sales representative, R. H. Campbell Co., Chicago, has been appointed sales manager, Admiral Die Casting Corp., there.

♦ ♦ ♦

Dr. John H. Hollomon has been named manager of the metallurgy research department, Research Laboratory, General Electric Co., Schenectady, N. Y., succeeding **William E. Ruder,** retired. Dr. Hollomon received his doctorate in metallurgy from Massachusetts Institute of Technology in 1946, when he joined the GE laboratory and later became assistant manager of the metallurgy research department.

♦ ♦ ♦

Gen. Donald Armstrong, since 1948 president of the United States Pipe & Foundry Co., East Burlington, N. J., has resigned to accept an important post abroad in connection with economic mobilization in Europe. Prior to joining the company in 1947, Gen. Armstrong was assistant chairman of the executive committee of the American Standards Association. He served in the U. S. Army for 37 years and during World War II was chief of the Chicago Ordnance District, later being commandant, Industrial College of the Armed Forces.

GEN. DONALD ARMSTRONG
. . . European appointment

N. F. S. Russell, who served as president of the U. S. Pipe Co. for 25 years and since 1949 has been chairman of the board, succeeds Gen. Armstrong as president. **Hubert F. O'Brien,** president, A. P. Smith Mfg. Co., East Orange, N. J., has been named a company director, and **James J. Reynolds Jr.** has returned to the company as assistant to the chairman of the board. Mr. Reynolds, who left the company in 1942 for Navy service, since 1946 has been a member of the National Labor Relations Board.

♦ ♦ ♦

Thomas N. Peck, director, aluminum alloy division, Vanadium Corp. of America, New York, has been appointed deputy director of the Aluminum and Magnesium Division, National Production Authority, Washington. Mr. Peck, on leave from Vanadium Corp., has succeeded **Timothy A. Lynch,** who has been named director of the Aluminum and Magnesium Division.

♦ ♦ ♦

Roy J. Heinz has been elected vice president, Pittsburgh Steel Foundry Corp., Pittsburgh, in charge of operations at its Glassport, Pa., foundry. Mr. Heinz has been general foundry superintendent at Glassport the last 6 years. He was previously associated with Union Steel Castings Division, Blaw-Knox Co., Pittsburgh.

♦ ♦ ♦

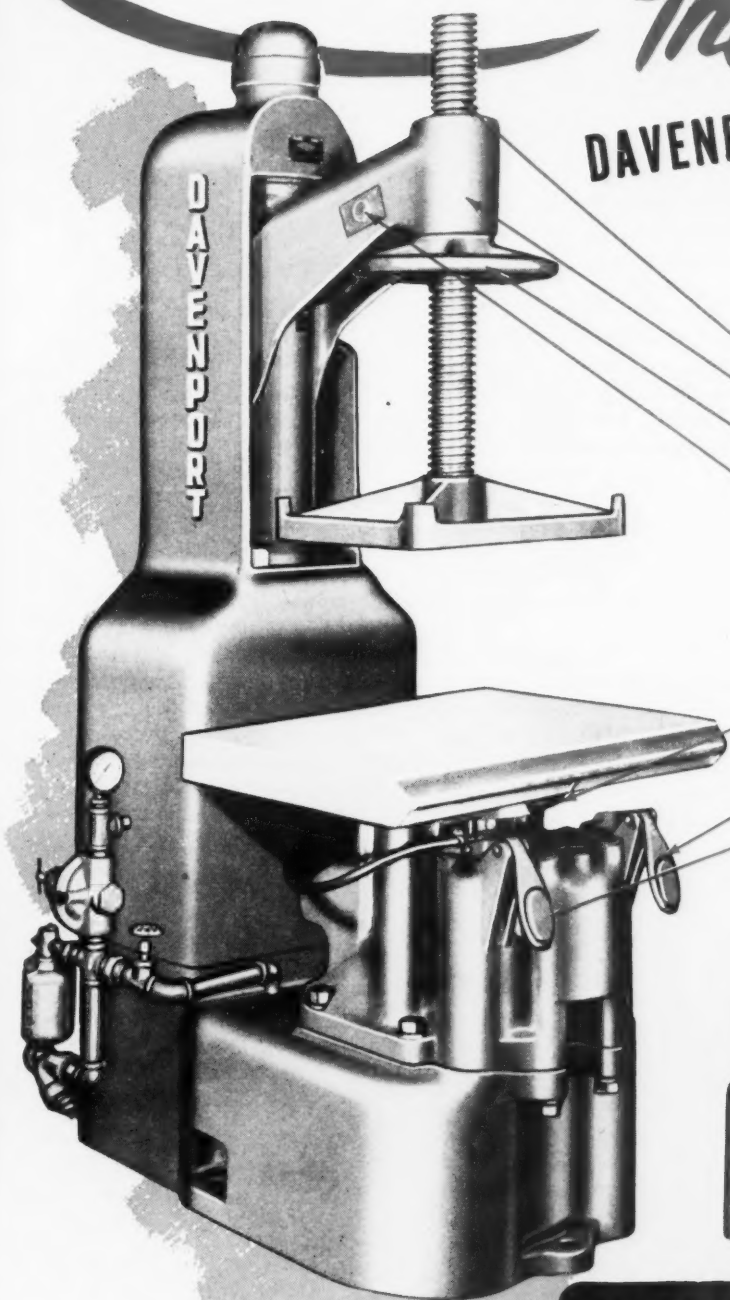
Dr. Herbert M. Meyer, editor, *Engineering Index Inc.,* New York, has been named an associate metallurgist in the metals research department, Armour Research Foundation, Illinois Institute of Technology, Chicago.

♦ ♦ ♦

C. John Sundberg has been appointed assistant to the vice president in charge of sales for the Abrasive Division, Norton Co., Worcester, Mass. He has been with the company 40 years. **Stephen Smith,** who has succeeded Mr. Sundberg as manager of the Worcester, Mass., sales office, was in the manufacturing and wage control departments of the company until 1949 when he was transferred to the sales department.

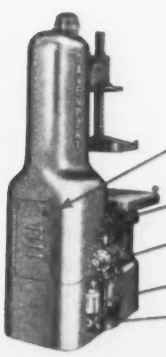
IT'S NEW IT'S RUGGED
IT'S FAST IT'S EFFICIENT

The NEW
DAVENPORT JOLT SQEEZER
MODEL 13JX



SPECIFICATIONS
Squeeze Piston Dia.—13″
Jolt Piston Dia.—6″
Table Size—20″x 27″

- Screw Adjustment
- Swing Arm
- Hand Wheel Screw Adjustment Lock
- Electrically Controlled Push Button
- Squeeze Increases efficiency of operation
- Valveless Jolt and Self Cleaning Striking Pad
- Jolt Knee Valve
- Vibrator Knee Valve



REAR VIEW

- Electric Connection for Squeeze Operation
- Air Pressure Guage
- Squeeze Pressure Regulator
- Automatic Air Lubricator
- Air Inlet

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AFS NOMINATES OFFICERS AND DIRECTORS

Announces Medalists for 1952

NOMINATIONS for new officers and directors to be elected during the International Foundry Congress and Show at Atlantic City, N. J., May 1-7, have been announced by the American Foundrymen's Society. At the same time the society disclosed the names of seven individuals who will be recipients of the 1952 AFS gold medal and honorary life membership awards.

I. R. Wagner, director, Electric Steel Castings Co., Indianapolis, currently serving the society as vice president, is the presidential nominee for 1952-53. Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich., has been nominated as vice president of the society.

Five directors nominated to serve three years are: Martin A. Fladoes, president, Sivyer Steel Castings Co., Milwaukee; Walter J. Klayer, works manager, Aluminum Industries Inc., Cincinnati; J. O. Klein, vice president and secretary, Texas Foundries Inc., Lufkin, Tex.; A. D. Matheson, general manager, French & Hecht Division, Kelsey-Hayes Wheel Co., Davenport, Iowa; H. G. Robertson, works manager, American Steel Foundries, Alliance, O.

Walter L. Seelbach, president, Superior Foundry Inc., Cleveland, is nominated for a one-year directorship upon completion of his present term as AFS president.

Members of the AFS Nominating Committee which selected nominees for officers and directors are:

Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, past president (1950-51) chairman; Edwin W. Horlebein, Gibson & Kirk Co., Baltimore, past president (1949-50); Manley T. Brooks, Dow Chemical Co., Bay City, Mich., representing Saginaw Valley Chapter and light metals; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., representing Quad City Chapter and gray iron; Martin E. Rollman, Cincinnati Milling Machine Co., Cincinnati, representing Cincinnati District Chapter and gray iron; V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind., representing Michiana Chapter and equipment; Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., representing New England and education; F. M. Wittlinger, Texas Electric Steel Casting Co., Houston, Tex., representing Texas Chapter and steel; R. C. Woodward, Bucyrus-Erie Co., South Milwaukee, Wis., representing Wisconsin Chapter and steel.

Four gold medals and three honorary life memberships will be awarded by the AFS at the annual banquet to be held Saturday evening, May 3, during the International Foundry Congress in Atlantic City. Recipients selected by the Board of Awards include:

Frank G. Steinebach, editor, FOUNDRY, to receive the John A. Penton medal "for outstanding contributions to the foundry industry and the society."

H. Morrogh, British Cast Iron Research Association, who will receive the William H. McFadden medal "for outstanding work and development in the field of spheroidal cast iron."

Albert Portevin of France, to be awarded the Joseph S. Seaman medal "for technical contributions over many years to the arts and sciences of the foundry industry."

A. P. Gagnebin and K. D. Millis, International Nickel Co., Bayonne, N. J., named jointly to receive the Peter L. Simpson medal "for outstanding work and development in the field of spheroidal cast iron."

William G. Mixer, Pontiac, Mich., foundry consultant and for many years with Buick Motor Division, to receive an honorary life membership "for a lifetime of service and application of engineering to the foundry industry."

A. I. Krynitsky, recently retired from the National Bureau of Standards, Washington, named for an honorary life membership "for a lifetime of fundamental research in the field of metal casting."

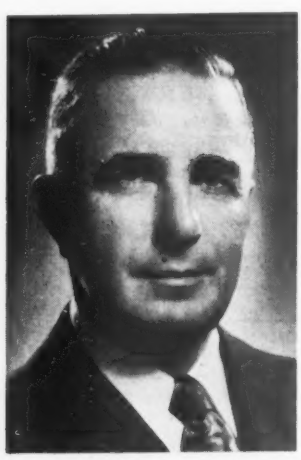
Walter L. Seelbach, Superior Foundry Inc., Cleveland, to receive an honorary life membership as retiring president of the society.

Members of the AFS Board of Awards which selected the award winners comprise the seven immediate past national presidents of the society. They are: Walton L. Woody, National Malleable & Steel Castings Co., Cleveland; Edwin W. Horlebein, Gibson & Kirk Co., Baltimore; Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; William B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh; Fred J. Walls, International Nickel Co., Detroit; Sheldon V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; Ralph J. Teetor, Cadillac, Mich., board chairman.

An additional presentation to be made at Atlantic City is the Award of Honor of the International Committee of Foundry Technical Associations. The AFS is a member of this group and as such has been invited to recommend the recipient of the award. This will be the second Award of Honor, an original reproduction of Cellini's statue representing the victory of Perseus over the Gorgon Medusa of Greek mythology. Rene Deprez of Belgium received the first award at the 1951 International Foundry Congress in Brussels.

International character of the Congress and Foundry Show is expected to swell attendance with a sizable group of visitors from abroad. A total attendance of 15,000 or more is looked for. The fact that the

(*Concluded on page* 137)



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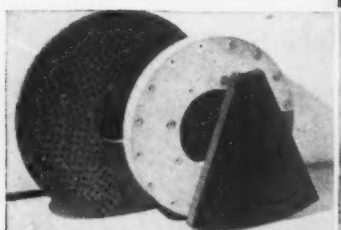
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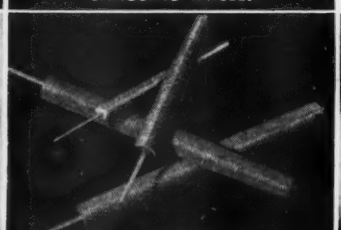
REINFORCED DISC-WHEELS


CORE FILES

MOUNTED POINTS

BAY STATE BUILDS A RUGGED LINE OF FOUNDRY PRODUCTS

(*Concluded from page* 134)

annual meeting will extend over seven days, two days longer than usual for an exhibit-year convention, will help to increase registrations.

Most of the available exhibit space of 90,000 square feet in Convention Hall, headquarters for the week's activities, has been allotted to equipment and supplies companies. Hotel reservations now are going out from the AFS Housing Bureau, 16 Central Pier, Atlantic City, which is servicing all housing requests.

Meanwhile the various AFS divisions are readying their programs of technical papers and discussions to be presented during six days of the convention. No technical program is scheduled for Sunday, May, 4, although the Foundry Show will be open. Foundrymen of the district may visit the exhibits that day without paying a registration fee.

Plant inspections, always an attractive feature of past conventions, are included in the 1952 programs. Chartered busses will be available to take visitors to nearby foundries.

Spreading the technical sessions over six days permits scheduling the gray iron and sand shop courses in the afternoons, instead of in the evenings as formerly. The only evening events planned are various dinner sessions. These include the chapter officers and directors dinner Friday, the annual banquet Saturday, the United Kingdom dinner Sunday, the alumni dinner Monday and the Educational Division dinner Tuesday. The convention officially will close at 4 p.m. Wednesday, May 7.

Increases in Apprentice Training

Bureau of Apprenticeship of the U. S. Labor Department reports a noticeable uptrend in development of the much needed craftsmen in skilled trades listed as critical, especially in four of the trades where there has been the greatest need — machinist, tool and die making, molding and coremaking and patternmaking. From June to November there was 12 per cent gain in the number of registered apprentices in training in these trades —from 11,357 to 12,696. Tool and die trade showed a 20 per cent gain in number of apprentices employed during that peroid. Machinist trade showed a gain of nearly 8 per cent and the percentage increase in molding and coremaking and patternmaking trades was 7.5 and 6.5 per cent, respectively.

FEF ADVISORY GROUP MEETING

To Feature Design Symposium

A Symposium on casting design tecnnology will feature the 1952 conference of the Foundry Educational Foundation's Technical Advisory Committee and University Advisory Committee. The annual joint meeting of these groups will be held at Hotel Statler, Cleveland, Feb. 14-15.

Prof. P. E. Kyle, Cornell University, will be chairman of the design symposium, which will have these speakers: C. W. Briggs, technical and research director, Steel Founders' Society of America; C. O. Burgess, technical director, Gray Iron Founders' Society; T. E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa.; J. H. Lansing, technical director, Malleable Founders' Society; Prof. E. T. Vincent, chairman, Department of Mechanical Engineering, University of Michigan.

Discussion will cover present knowledge, practice and status of design technology in the foundry field, together with current and planned developments. Basic investigations in progress and in prospect indicate that design technology of cast metals is likely to experience considerable growth in the near future.

Prof. Howard F. Taylor, MIT, will preside at a conference session devoted to "Engineering Level Foundry Instruction." This will include a review of present teaching aids and techniques, examples of laboratory exercises in FEF schools, and an interpretation of material prepared since the war by the Ecole Superieure de Fonderie, Paris, France, under the direction of Jean Laine. Much of the latter material is adapted to engineering level instruction in American engineering colleges.

Prof. Taylor also will introduce to educators attending the conference a new book on metals processing written by Prof. John Wulff, in charge of metal processing, and his staff of the Metallurgical Department, MIT. About one-third of the book is devoted to metal casting and foundry technology.

Prof. George J. Barker, University of Wisconsin, chairman of the Educational Division, AFS, will summarize the conference and close the meeting following the Frinday luncheon.

The detailed program follows:

Thursday, Feb. 14

Session I

A—Future of Foundry Educational Foundation —M. J. Allen, American Steel Foundries
B—Summary of 1951 and previous conferences—G. K. Dreher, FEF
C—Basic process chart of the industry—H. C. Esgar, FEF
D—Summary of the foundry industry—W. G. Gude, FOUNDRY
E—College statistical summary charts
F—Analysis and survey of research, consulting, seminars, short courses, night school, correspondence courses and other services of value and benefit to the foundry industry—G. K. Dreher
G—College — military — foundry relationships —S. C. Massari, technical director, AFS
Lunch—12:15

Session II

A—Symposium on casting design. Chairman—Prof. P. E. Kyle, Cornell University
B—Questions-and-answer panel. Chairman — Prof. P. E. Kyle
Dinner—6:15

Friday, Feb. 15

Session III

A—Engineering level foundry instruction. Chairman—Prof. H. F. Taylor, MIT
Review of present teaching aids and techniques
Examples of foundry instruction from present Foundry Educational Foundation schools
Interpretation of French foundry industry data
Introduction of book—*Metals Processing*
Lunch—12:15
Closure—Prof. G. J. Barker, University of Wisconsin, Chairman, Educational Division, AFS
Adjourn—2:30 p.m.

Motor vehicle builders and machinery manufacturers each consumed about 3½ million tons of gray iron and malleable iron castings in 1950, according to the Bureau of the Census, Washington.

HOWARD F. TAYLOR

GEORGE J. BARKER

PETER E. KYLE

BUFFALO FOUNDRIES ARE HOST

To Engineering Students

A GROUP of Buffalo area foundries recently reversed the usual practice of going to college campuses to interview engineering students for possible employment. Instead, 22 students from Case Institute of Technology and Cornell University—two Foundry Educational Foundation Schools—were invited to Buffalo for two days as guests of 14 companies there, 13 of which operate foundries in the district. Pennsylvania State College students also were invited, but a schedule conflict prevented their attendance.

The boys arrived Thursday evening, Nov. 29, and were quartered at the Buffalo Athletic Club. Friday morning after breakfast the visitors were split into two groups to facilitate the plant trips. Group "A" visited the Symington-Gould Corp., Pohlman Foundry Co., Worthington Pump & Machinery Corp. where lunch was served, Buffalo Forge Co. and Acme Steel & Malleable Iron Works. Group "B" spent the day seeing the Buffalo Pipe & Foundry Corp., Standard Buffalo Foundry Inc., Kencroft Malleable Co. Inc., American Radiator & Standard Sanitary Corp. where lunch was served, Pratt & Letchworth Co., Inc. and Atlas Steel Casting Co.

That evening an informal reception and dinner was held at the Buffalo Club. The after-dinner program, under the chairmanship of Grant Diamond, president, Electro Refractories & Abrasives Corp., included brief descriptions of the foundry educational programs at Case and Cornell by Profs. Charles Walton and Peter E. Kyle. Words of appreciation and a highly favorable student reaction were conveyed by Dan Profant, senior from Case, and Paul L. Widener, senior from Cornell. Representatives of the Buffalo management group briefly discussed the growth and development of the foundry industry and the increasing need for engineering talent in foundries. The presentations were followed by a question-and-answer session.

Saturday morning a chartered bus picked up the entire party for additional plant visits. Tours through McCallum Bronze Co. and Blaw-Knox (Buflovak Equipment Division) brought the trip to an end.

From comments following the trip the boys left their hosts with a much better understanding of foundries and foundrymen in general and a highly favorable attitude toward Buffalo foundries in particular. The Buffalo management group created for themselves a closer relationship with the schools, as well as a potential reservoir of technical talent.

Foundry engineering students at Cornell (above) and Case. Shown with latter group is Prof. Charles F. Walton (second from left, back row)

Alloy Casting Institute Elects Officers

Harvey T. Harrison, vice president in charge of sales, the Duraloy Co., Scottdale, Pa., has been elected president of the Alloy Casting Institute, national organization of heat and corrosion resistant casting producers. Mr. Harrison, until recently vice president of the institute, has been succeeded as vice president by R. H. English, chief metallurgist, National Alloy Steel Division, Blaw-Knox Co., Pittsburgh, who has served as a director and as chairman of the institute's technical research committee. W. H. Worrilow Jr., Lebanon

HARVEY T. HARRISON

Steel Foundry, Lebanon, Pa., has been elected a director of Alloy Casting Institute.

Mr. Harrison joined the Duraloy company 24 years ago, spent two years in the New York office, 7 years in Cleveland and the last 15 years at Scottdale in charge of sales. Prior to joining the company he operated a small alloy foundry in Conshohocken, Pa., known as the Chrome Alloy Products Co. He attended Lafayette College where he specialized in metallurgy of iron and steel and since then has spent his entire career in the manufacture and sale of iron and steel and high alloy castings.

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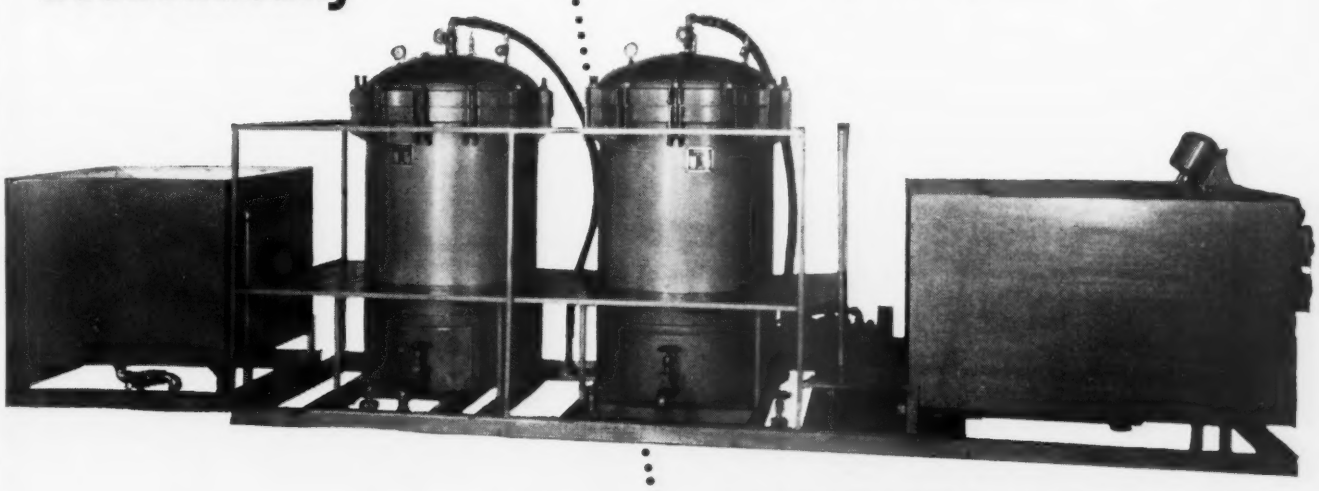

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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	713,330	371,214	.....
1950			
Oct.	89,968	50,157	160,278
10 mo.	743,829	412,431	.....
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,192	.....
1951			
Jan.	92,508	54,817	234,060
Feb.	88,950	54,915	255,347
Mar.	101,667	60,265	267,169
Apr.	97,276	57,554	276,463
May	100,800	61,373	274,954
June	94,376	57,176	258,144
July	76,826	45,072	263,017
Aug.	90,727	57,164	249,273
Sept.	82,276	48,568	244,575
Oct.	92,386	56,754	229,995
10 mo.	917,792	553,658	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1949	724,053	654,444	37,311	.....
1950				
Oct.	105,646	96,811	5,064	65,355
10 mo.	817,986	741,312	40,995	.....
Nov.	103,694	93,607	5,776	67,931
Dec.	100,548	90,513	5,985	69,569
Total	1,016,180	918,883	52,756	.....
1951				
Jan.	102,643	92,171	6,363	77,580
Feb.	96,946	87,667	5,427	75,967
Mar.	110,887	100,221	6,405	79,766
Apr.	101,506	91,852	5,802	82,711
May	105,438	95,049	5,986	84,002
June	98,559	88,818	5,358	83,518
July	76,551	69,334	4,064	85,837
Aug.	94,443	84,720	5,097	84,821
Sept.	85,433	76,304	5,161	84,611
Oct.	94,534	84,489	5,728	82,695
10 mo.	966,940	870,625	55,931	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Shipments—Die	Unfilled Orders[2]
1949	304,409	106,825	102,908	87,812	.....
1950					
Oct.	47,286	16,002	14,893	15,408	102,938
10 mo.	359,809	122,253	114,729	114,624	.....
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,538	14,401	14,554	12,641	93,264
Feb.	40,785	14,106	13,082	12,852	94,581
Mar.	42,204	15,900	12,771	12,677	100,453
Apr.	40,242	14,455	12,901	12,079	106,077
May	40,487	14,798	13,400	11,692	112,638
June	35,961	13,853	10,323	10,850	112,760
July	27,426	10,739	7,142	8,693	119,461
Aug.	35,531	14,128	10,922	9,526	117,888
Sept.	32,487	13,086	8,829	9,730	122,973
Oct.	35,222	13,950	10,131	10,297	110,382
10 mo.	372,883	139,416	114,055	111,037	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	9,364	8,781	....
1950			
Oct.	1,354	1,297	5,573
10 mo.	9,278	8,704	....
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616
Feb.	1,907	1,801	10,878
Mar.	2,156	2,058	12,196
Apr.	2,267	2,161	12,191
May	2,334	2,206	12,867
June	1,758	1,642	14,331
July	1,676	1,557	15,528
Aug.	2,270	2,135	16,095
Sept.	2,010	1,931	16,407
Oct.	2,371	2,300	16,143
10 mo.	20,589	19,530	....

Foundry Production Workers

Estimated Number

	Oct. 1951	Sept. 1951	Oct. 1950
Gray Iron	153,500	156,000	153,600
Malleable	28,000	28,000	24,700
Steel	65,300	64,600	51,200
Nonferrous	85,900	87,800	89,800

Average Weekly Earnings

Gray Iron	....	$68.43	$70.58
Malleable Iron	....	71.04	69.15
Steel	....	76.71	69.63
Nonferrous	....	75.91	72.29

Average Weekly Hours

Gray Iron	....	41.2	44.5
Malleable Iron	....	41.4	42.5
Steel	....	42.9	42.9
Nonferrous	....	42.6	42.8

Labor Turnover Rate (Sept.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.3	5.5	3.4	1.4
Malleable Iron	4.9	5.8	4.5	0.1
Steel	7.4	6.1	4.8	0.3
Nonferrous	4.3	7.4	3.1	3.4

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(Net tons[1])

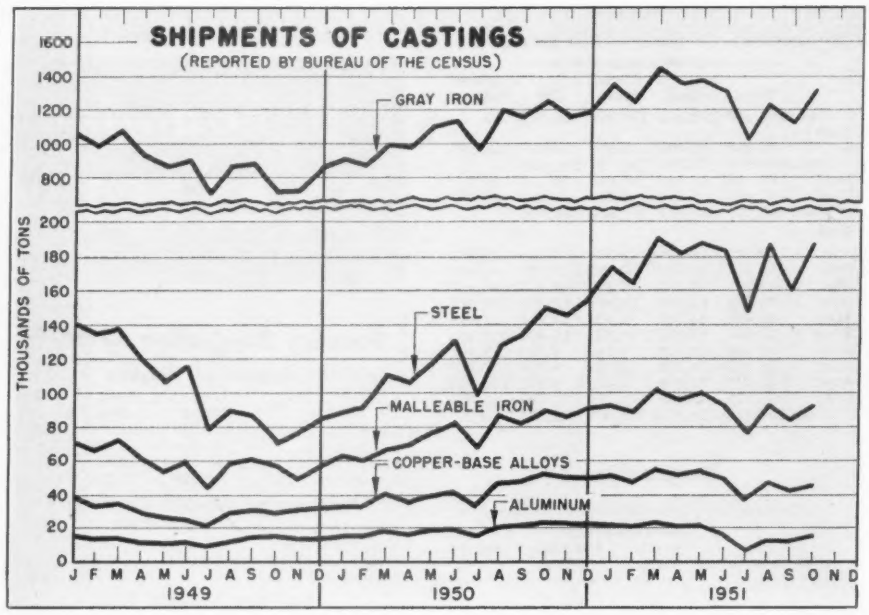
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Heavy Steel Ingot Molds Total	Heavy Steel Ingot Molds For Sale	Chilled Railroad Car Wheels Total	Chilled Railroad Car Wheels For Sale	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3] Total
1949	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
10 mo.	10,562,818	5,570,678	6,638,412	2,739,175	1,913,699	861,462	426,214	376,350	977,331	617,460	.....
Oct.	1,254,901	700,512	792,464	364,607	220,821	100,082	46,516	41,023	119,105	75,699	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	2,012,480
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Jan.	1,364,311	762,407	875,437	405,863	228,824	103,475	56,046	49,065	131,779	72,225	2,297,705
Feb.	1,234,226	684,928	811,724	369,932	193,648	91,598	49,423	43,967	117,141	62,290	2,391,843
Mar.	1,440,149	818,473	920,802	427,162	231,853	114,858	62,282	57,241	144,620	74,592	2,389,659
Apr.	1,363,041	766,735	880,381	403,619	217,970	106,417	61,993	54,002	134,302	68,395	2,336,926
May	1,396,236	796,053	897,913	418,950	225,129	112,145	65,721	57,485	139,854	67,619	2,228,596
June	1,308,987	742,794	847,024	395,329	216,620	108,042	58,620	52,700	121,851	64,872	2,162,152
July	1,028,812	568,126	653,656	301,749	200,764	97,575	40,792	35,202	88,217	45,383	2,208,116
Aug.	1,218,832	697,952	779,838	378,042	222,721	109,257	50,127	44,507	115,284	50,862	2,144,587
Sept.	1,114,789	625,511	704,657	328,331	204,856	96,011	45,467	41,360	111,893	47,916	2,055,392
Oct.	1,303,178	734,261	815,815	382,405	244,556	115,738	53,172	46,483	130,636	58,999	1,991,331
10 mo.	12,772,561	7,194,259	8,187,247	3,811,382	2,196,941	1,055,116	543,643	482,012	1,235,577	623,153	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3] Total
1949	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
10 mo.	1,159,195	820,929	196,531	851,942	615,751	181,810	307,253	206,178	15,811	.....
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Jan.	174,056	124,002	42,805	135,086	98,197	37,790	38,970	25,805	5,015	675,385
Feb.	163,976	117,156	42,565	126,293	93,461	36,793	37,683	23,695	5,772	706,989
Mar.	190,665	134,184	44,196	148,884	107,745	39,492	41,781	26,439	4,744	779,717
Apr.	181,908	129,059	41,545	139,948	102,367	37,553	41,960	26,692	3,992	846,947
May	189,232	131,102	39,845	143,201	101,363	35,511	46,031	29,739	4,334	881,702
June	184,424	131,219	42,337	141,538	103,090	38,200	42,886	28,129	4,137	895,054
July	147,251	100,141	27,585	111,964	78,034	24,516	35,287	22,107	3,069	929,978
Aug.	177,096	128,981	41,763	130,913	99,732	36,086	46,183	29,249	5,677	944,211
Sept	160,695	116,658	35,500	120,632	89,771	33,086	40,063	26,887	2,414	918,038
Oct.	189,929	139,953	39,984	138,610	104,449	36,488	51,319	35,504	3,496	891,508
10 mo.	1,759,132	1,252,455	408,125	1,337,069	978,209	355,515	422,163	274,246	42,650	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	1951
Jan.	159.3	668.0
Feb.	113.1	638.6
Mar.	225.2	595.0
Apr.	160.6	490.1
May	294.9	431.7
June	622.7	393.2
July	401.8	390.3
Aug.	693.6	404.5
Sept.	483.8	346.5
Oct.	526.8	372.4
Nov.	885.5	305.5
Dec.	526.2	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
Nov.	6,243,970	6,131,733	317,120
11 mo.	65,391,205	66,244,308	3,014,059
Dec.	6,606,464	6,590,823	323,458
Total	71,997,669	72,835,131	3,337,517
1951			
Jan.	6,791,828	6,766,767	330,698
Feb.	6,001,538	6,036,774	293,169
Mar.	6,692,460	6,693,661	299,190
Apr.	6,484,258	6,354,400	356,816
May	6,747,163	6,732,825	368,511
June	6,574,621	6,645,155	330,920
July	6,636,335	6,502,058	301,125
Aug.	6,777,820	6,679,152	303,664
Sept.	6,468,080	6,364,628	272,402
Oct.	6,733,876	6,719,087	292,654
Nov.	6,478,523	6,545,686	271,649
11 mo.	72,386,502	72,040,193	3,420,798

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Mar.	22,494	31,997
Apr.	22,118	30,472
May	23,643	33,267
June	25,093	33,817
July	21,609	32,016
Aug.	29,689	25,285
Sept.	28,811	22,285
Oct.	32,240	23,124
Nov.	31,748	23,544
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
10 mo.	439,728	277,828	.....
Total	536,398	341,833	.....
1951			
June	41,341	28,278	95,174
July	34,064	23,088	85,028
Aug.	37,321	22,985	80,588
Sept.	31,507	20,021	81,539
Oct.	36,230	22,608	76,589
10 mo.	392,511	255,549	.....

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap—Total	All Scrap—Purchased	By Types of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1949	49,281,000	22,922,000	7,968,000	4,175,000	801,000	276,000	4,239,000	2,608,000
1950								
Oct.	5,643,000	2,707,000	866,000	437,000	108,000	40,000	643,000	384,000
10 mo.	50,843,000	24,205,000	7,830,000	3,917,000	889,000	324,000	5,182,000	3,003,000
Nov.	5,293,000	2,598,000	841,000	431,000	107,000	39,000	593,000	364,000
Dec.	5,361,000	2,600,000	803,000	418,000	122,000	44,000	600,000	361,000
12 mo.	61,497,000	29,403,000	9,474,000	4,666,000	1,118,000	407,000	6,385,000	3,828,000
1951								
Jan.	5,975,382	3,010,300	1,009,142	533,705	110,004	41,116	684,484	435,633
Feb.	5,337,562	2,691,692	936,918	492,395	101,233	38,135	627,308	398,814
Mar.	6,187,520	3,100,622	1,064,325	558,833	108,513	39,260	728,786	463,371
Apr.	5,987,947	3,013,527	1,029,069	545,897	103,458	37,973	704,416	457,521
May	6,096,678	3,087,313	1,063,281	568,198	111,914	39,312	734,483	484,878
June	5,693,402	2,847,856	972,949	517,604	108,740	39,454	693,636	462,092
July	5,298,644	2,581,856	747,864	393,254	80,903	29,858	632,782	421,689
Aug.	5,614,535	2,721,287	.....	.....	.....	.....	.....	.....
Sept.	5,377,491	2,585,665	.....	.....	.....	.....	.....	.....
Oct.	5,869,590	2,826,221	.....	.....	.....	.....	.....	.....
10 mo.	57,438,751	28,466,339	.....	.....	.....	.....	.....	.....

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons): Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons): Total	Cupola	Air	Electric
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
10 mo.	53,663.4	2,403.6	2,408.8	41,982.4	6,857.7	48,531	4,567	245	197
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	5,367	542	32	11
Feb.	5,084.8	238.7	226.0	4,007.2	612.9	4,725	492	29	10
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	5,406	550	33	15
Apr.	5,812.2	259.1	261.0	4,575.8	716.1	5,281	516	31	11
May	6,104.9	282.0	259.4	4,777.0	786.5	5,522	533	31	11
June	5,911.3	254.2	276.5	4,631.9	748.7	5,348	486	30	11
July	5,994.8	280.4	250.0	4,702.8	761.6	5,317	378	23	10
Aug.	5,988.6	252.7	254.4	4,723.3	758.2	5,385	...	..	..
Sept.	5,811.6	257.7	243.7	4,576.8	733.4	5,266	...	...	...
Oct.	6,112.6	260.6	299.4	4,777.4	775.2	5,601	...	...	...
Nov.	5,824.5	285.5	269.0	4,532.1	737.9	....	...	...	...
11 mo.	64,366.4	2,938.8	2,911.5	50,481.6	8,034.6	....	...	...	...

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.

100% RETURN ON INVESTMENT in one year

with

WHEELABRATOR

AIRLESS BLAST CLEANING

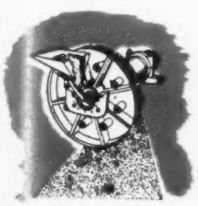
LENNOX FURNACE COMPANY, Marshalltown, Iowa, replaced nine tumbling mills with a Wheelabrator Tumblast for cleaning gray iron furnace castings. Within a year savings effected through lower cleaning costs and faster production were sufficient to pay for the entire investment. Since that time they have been getting a daily bonus of $35.36.

CLEANING TIME SLASHED 80% —The Wheelabrator cleans as much work in 15 or 20 minutes as could be done in an hour and three quarters in tumbling mills.

SAVES 29 MANHOURS DAILY —Two men clean 17 tons of furnace castings in 16 manhours where five men previously worked a total of 45 hours to clean 16 tons.

IMPROVES CASTING APPEARANCE —Carl Cordt, Foundry Superintendent, sums up the advantages of the Wheelabrator as follows: "It is so much cleaner, so free from noise as compared with the old method, and so much more efficient in the manner in which it cleans the castings that I am surprised now how we ever got along without it."

HERE'S HOW YOU CAN SAVE —Based upon the results of thousands of installations, Wheelabrator airless blast cleaning probably can make the same savings for you. An expert analysis of your cleaning problems by one of our engineers will give you complete facts on the results Wheelabrating will provide. There's no obligation, of course. Write for details.



WHEELABRATOR— The perfected airless centrifugal blast unit pioneered by ***American*** slashes cost and cleaning time. Conserves power, labor, space. Cleaning perfection results in longer tool life, faster machining and grinding, easier inspection.

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WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka 2, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST CLEANING EQUIPMENT

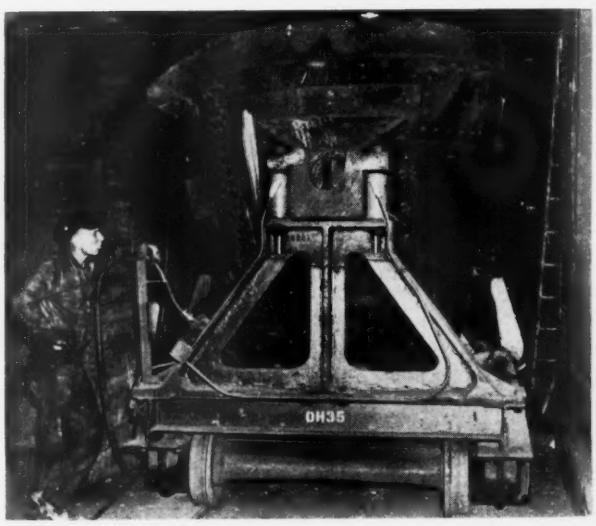
NEWS VIEWS

U. S. Army photo

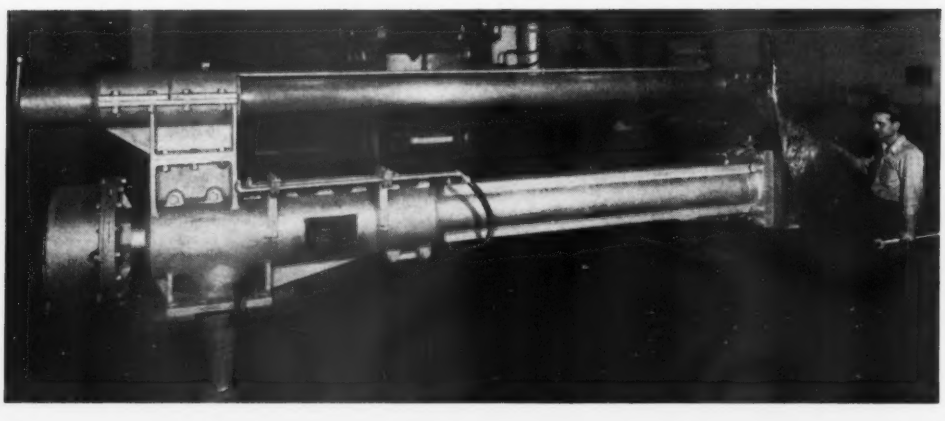
▲ **CAST ARMOR:** Col. R. K. Haskell, chief, Chicago Ordnance District, U. S. Army, and C. C. Jarchow, president, American Steel Foundries, sign contract for reactivation and operation, by the company, of government-owned Cast Armor Plant, East Chicago, Ind. Looking on are Maj. Gen. E. L. Ford (left) and Brig. Gen. E. L. Cummings, chief and assistant chief of Ordnance, respectively. The plant, largest steel foundry in the United States, will produce tank hulls and turrets.

Wide World photo

▲ **NEW NAM HEAD:** Wm. J. Grede, president, Grede Foundries Inc., Milwaukee, is shown with Mrs. Grede at the recent annual meeting of the National Association of Manufacturers in New York. Mr. Grede was elected president of the association at this meeting.

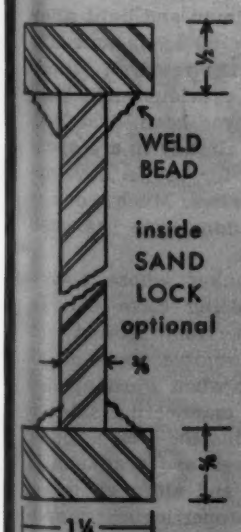


→ **LADLE WEIGHER:** Greater efficiency and economy in producing small quantities of high-alloy steels to accurate specifications are achieved by use of this electronic weighing ladle car at Standard Steel Works Division of Baldwin-Lima-Hamilton Corp., Burnham, Pa. Four SR-4 load cells, 20,000-lb capacity each, are built into the car as supports for the ladle and are connected to a dial indicator in the control pulpit. Quick and accurate weighing of the ladle's contents simplifies addition of correct amount of alloys; it also indicates continuously, how many molds can be poured from the ladle.



← **BIG HOLDER:** One of six large automatic electrode holders built by the Whiting Corp. for an electric furnace steel producer. It will be used on a 70-ton top charge type furnace. The holder permits automatic slipping of electrodes, reducing furnace down time. The graphite electrodes are 20 in. diameter.

McNALLY-PITTSBURG Found Why Heavy Duty BS&B FOUNDRY FLASKS *Stand Up Longest!*



TYPE FP22

Cross Section of Flask wall showing wall thickness, bearing bar size and welding. Reinforcing rib is optional.

McNally-Pittsburg, one of the world's greatest producers of heavy mining equipment have more than 300 BS&B Heavy Duty Foundry Flasks in their modern foundry at Pittsburg, Kansas. Over the past seven years these BS&B Flasks have proved to this firm that they stand up longest in heavy service, with the lowest maintenance and replacement cost and the greatest over-all economy in casting.

The secret of this flask's stamina lies in the stronger, double-welded construction. The bearing bars are securely welded to the walls both inside and outside. The bearings can't break down, the section separate or deform. As a result, maintenance is cut to a minimum, even under the hardest use. It will maintain its original dimensions and pincenters over a longer period of time.

BS&B lightweight, medium duty and heavy duty foundry flasks are made in round, square, rectangular shapes. Pinlugs, available in all styles, are standard equipment and can be had in any arrangement or combination you desire. Special flasks can be made to your specifications.

YOUR FREE COPY *of the BS&B Foundry Flask Catalog will be sent promptly on request. It's a most useful foundryman's handbook with complete diagrams, specifications, tables and an easy-to-order system.*

FOUNDRY BS&B FLASKS

BLACK, SIVALLS & BRYSON, INC.

Foundry Flasks Division

Dept. 7-AR2 7500 East 12th Street Kansas City 3, Missouri

AROUND THE COUNTRY

News Reports from . . .

OPERATIONS of gray iron jobbing foundries in this area continue spotty. Overall, they probably average not more than 75 per cent of capacity, with shops making lighter castings off more than those producing heavier types. New orders are coming in slowly and upwards of 90 per cent are of rated category.

Limitations on production of consumer goods, such as household appliances, is partially responsible for reduced business volume. Another factor is that manufacturers of numerous classes of goods find themselves with excess castings inventories, therefore holdbacks on further deliveries are being issued.

All raw materials, except alloys which remain extremely tight, have eased perceptibly. This even includes pig iron. Some foundries are asking delays in shipments to prevent exceeding the 30-day inventory limit, but sellers still have places to ship all of the iron available. Coke is the easiest it has been in a long time and producers are doing an active selling job to keep output moving.

Foundries are fearful that pig iron may develop new and uncomfortable tightness between now and spring. Shortage of scrap, hastened by heavy snows and severe cold in late December and early January, brought curtailment of steelmaking at one district steel mill at turn of the year, and other plants may suffer the same fate soon. There is the possibility that more blast furnace product may be used as hot metal to keep steelmaking at the highest possible level, thus reducing merchant iron output. Forty of the district's 42 blast furnaces were operating as of mid-January, two being down for repairs.

Cast scrap now is an item in which gray iron shops can be choosey. Supply is more than adequate. This is due partly to increased use of pig iron in melts and to fact that collections of this grade of scrap have increased. It appears that current all-out drives for steelmaking scrap, which is so desperately short, are bringing in large quantities of cast material as a by-product.

C. R. Lindgren, vice president, Lindgren Foundry Co., Batavia, Ill., was elected president of the Chicago Foundrymen's Association at the organization's annual meeting Nov. 15. He succeeds F. J. Neudorf, treasurer, Sheffield Foundry Co., Chicago.

H. C. Swanson, vice president, Arrow Pattern & Foundry Co. Inc., Chicago, is the new vice president, and C. V. Adams, works manager, Vulcan Iron Works Chicago, was reelected secretary-treasurer.

New directors elected are Mr. Swanson and R. H. Lehmpuhl, secretary, Sheffield Foundry Co., Chicago.

POSSIBILITY that Lakey Foundry & Machine Co., Muskegon, Mich., will become an important producer of cast steel is exciting interest throughout the state. The company, now a gray iron producer, has submitted the low bid of $23.5 million on a proposal to construct, equip and operate a cast armor plant in the Muskegon area for the government.

The government-owned facility would be used for casting hulls and turrets for the medium tank which Ford Motor Co. will construct at its new plant in Livonia, Mich. The method of steel production and equipment which would be needed at the facility have not yet been determined, according to a reliable source.

Some indication of the size of the operation, however, is given by the fact that its largest castings would weigh in the neighborhood of 28 tons as cast and about 14 tons after machining.

The company, in its proposal, said it could have the plant completed in 1952 and could be in full operation by mid-1953. Some 1800 employees would be required.

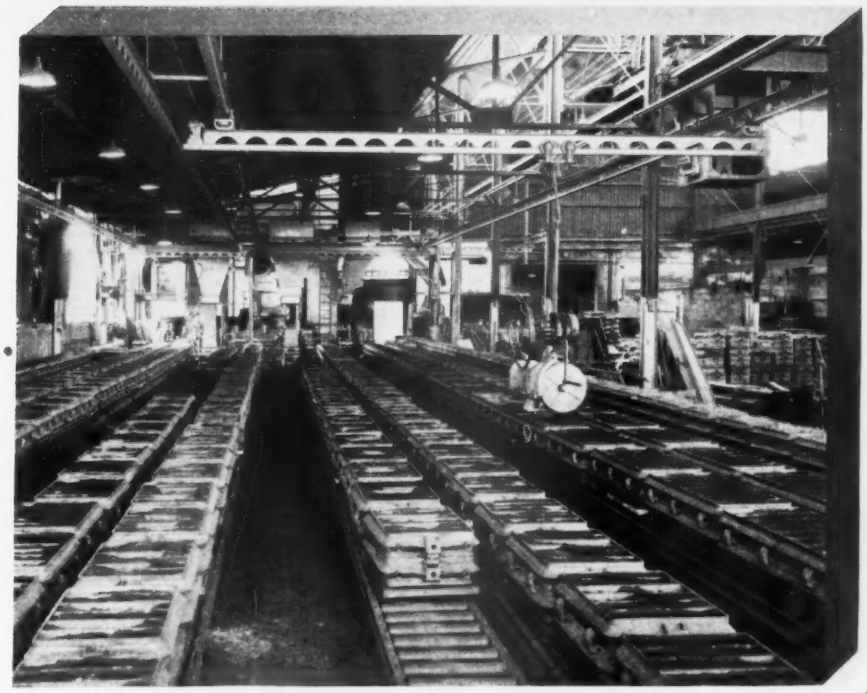
* * *

What some General Motors' people call a "task force" is now installed in the Metallurgy building at GM's new Technical Center, north of Detroit at Mound and Twelve Mile roads. The first group to set up operations in the building is the Research Laboratories' foundry department.

Where formerly the Research foundry had operated in a 2700-sq-ft area in the GM research building behind the General Motors Bldg. in Detroit, its operations now occupy 16,000 sq ft which is fast being equipped with the many kinds of specialized units necessary to give it pilot plant operation on virtually every kind of metal. Capacity for melting gray iron and heavy alloys, formerly limited to 135 lb per hour, has been vastly expanded, now being set at 1500 lb an hour. Its aluminum and light alloy capacity, formerly 80 lb, is now 250 lb. Ovens giving the research foundry four times its previous mold baking capacity have been installed. Among the units already in are special type furnaces for use in developing castings processes. Much work is reportedly being done with the shell molding technique.

Another automaker whose activities in shell molding have been a subject of much trade gossip for months showed tangible signs of its progress recently when Ford opened the doors of its engineering laboratories for a behind-the-scenes peek. Shell-molded valves and crankshafts were on display, and although information of their properties and manufacturing method was not obtainable, it is understood the valves are giving a good account of themselves in service (they began appearing in

(*Concluded on page* 148)



a mechanized foundry benefits everyone

● In the Foundry Industry, as in all others, the advantages of mechanization are far-reaching. The production of more and better castings, at less cost, which is made possible by modern foundry equipment, benefits the foundry employees, management, the shareholders or owners and the purchasers of the products on which the castings are used. It might be an automobile, a home appliance, an outboard motor, a farm implement or any one of a thousand products which are made better by the use of castings. The application of modern foundry equipment, and the efficiency and economy which it creates, is bringing more good things within the reach of more people.

Well-planned conveyer systems are usually pretty important in foundry mechanization programs. Today, Mathews Engineers are making available to American and Canadian Foundrymen the benefit of long experience with foundry conveying problems. This, and the facilities of three modern plants, is yours for the asking. Write or wire today for catalogs. Engineers in all principal cities.

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(*Concluded from page* 146)

late 1951 production model cars) and the crankshafts, with which all 1952 models will be equipped, outperform forged steel. Some of the other advantages which it is believed Ford may enjoy from the new alloy iron crankshafts are lower manufacturing cost, little machining, a more homogenous composition and better vibration dampening characteristics.

Possibly indicating a trend, at least one of the two new Ford engines—the six-cylinder overhead valve job—is being produced without valve seat inserts. By causing the valves to rotate and maintain a tight seat, need for the inserts is said to be eliminated.

Gray iron foundries in this area are undergoing a further reduction in their melt as the result of new cutbacks in automotive work, and from a materials standpoint many have reached the maximum inventory the government will permit them to hold.

FORD Motor Co.'s new gray iron foundry is well along toward completion insofar as the building and installation of major equipment are concerned, but no definite date has been announced for the start of commercial production of engine castings. Some departments have commenced work in a limited way, however, and it is expected that iron will be poured by spring.

Uncertainty attached to the extent of automobile assemblies this year of course will affect activity of the Ford plant in its intended role as a builder of motor car engines. However, for at least the foreseeable future governmental controls will hold the industry's output far below peak levels of recent years.

Reduced requirements of ferrous foundries in this district have eased the pressure on raw materials. Coke supplies are adequate for current needs and most users are disinterested in adding to inventories. A better balance in cast scrap supply and demand reflects lower operations at some shops, although there is a ready market either here or in other districts for what tonnages are being offered. A somewhat similar situation exists in pig iron, in contrast to the extremely tight market prevailing through much of 1951. All of the district's nine blast furnaces are active.

The Bureau of Labor Statistics is completing plans for a survey of the training and work experience of molders and coremakers. This survey, being conducted for the Department of Defense, will also provide detailed information on the movement from employer to employer and from city to city by workers in this skilled occupation. Additional data will be obtained on employment and training practices.

This study will provide valuable information for manpower planning purposes. It will also be useful for vocational guidance of veterans and young people. While special emphasis will be given to the industry's immediate manpower situation, attention will also be devoted to longer range problems.

Collection of the data will begin in February with visits to foundries in the Boston, New York-Newark, Philadelphia, Pittsburgh, Cleveland, Chicago, Detroit, and Los Angeles areas. Employers will be asked a series of questions designed to throw light on recruiting and training methods; and replacement needs, turn-over, and skill shortages.

In addition, plants will be requested to provide a list of their hand molders and coremakers. Individual workers selected from these lists will be interviewed in their homes by trained interviewers. They will be asked to describe their training and work experience, attitudes toward their trade, and provide selected personal information which will aid in understanding their job background.

All data obtained will be held confidential and will be used only in statistical tabulations. Lists of workers will be used only for arranging interviews.

This survey is one of the series covering occupations which are important in defense.

FOUNDRYMEN enter 1952 confident that a banner year is ahead. Most foundries have recovered from the fourth quarter slump despite a falling off of business in early January. Foundrymen point out that 1951 was a peak year for most foundries and that the year-end lows do not necessarily indicate poor prospects for 1952.

The trend to production of defense or defense-supporting items continues upward and helps to sustain foundry operations. One steel foundry had 10 per cent of its backlog in such work six months ago; now 30 per cent of its capacity is in defense or defense-supporting production.

For months past nonferrous foundries have been heavily engaged in defense production—up to 100 per cent of capacity—but the shortage of materials hampers their operations.

Steel scrap is scarce but most foundries have sufficient stocks to prevent hardship. However, the trend in supplies is downward and foundrymen are apprehensive over what the situation may be like in several months. Some foundrymen are paying up to $47 a ton for mixed light and heavy scrap and doing the segregating themselves. Shortage of alloys is a prime problem.

Some foundries trimmed working forces to offset fourth quarter lulls and labor is more plentiful than for the last six months.

LABORATORY ADDITION: Tousey Varnish Co., 520 25th St., Chicago, has added 1200 ft of floor area to its laboratory facilities, doubling the capacity of its Development and Research Divisions. Each of these departments is equipped with spray booths, grinding mills and mixers, ovens, and other equipment for developing new products

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By EDWIN BREMER

Foundry DEVELOPMENTS

INVESTIGATION of malleable iron production by Nobuhisa Tsutsumi, and published in *Reports of the Casting Research Laboratory,* Waseda University, Tokyo, Japan, indicates that austenitic malleable iron can be obtained by single stage annealing. White iron used contains 2 to 3 per cent TC, 1 to 2 per cent Si, 8 to 13 per cent Mn, 0.15 per cent P, and 3 to 5 per cent Ni or Cu. Annealing time of 40 to 60 hr at 950° C (1742° F) gave a malleable iron with an austenitic matrix and temper carbon at room temperature. The material shows tensile strengths from 40 to 50 kg per sq mm (56,890 to 71,100 psi) and hardnesses from 9 to 22 Rockwell C. A reducing atmosphere during annealing is required to hold the decarburized rim to a minimum. Further work is to be conducted to determine the ductility properties of the iron.

* * *

BRITISH foundry producing heavy electrical generating equipment developed a procedure to insure solid metal with a sound clean face in the barrel of the low-pressure cylinder casting. Made of gray iron, blading is assembled in serrated grooves cut to a depth of 1½ to 2 in. in a 4¾-in.-thick section, and the peaks of the serrations must be free from porosity and open grain. To obtain the desired close-grained but machinable surface on the cylinder casting, the core forming the barrel is made with a facing of silicon carbide blocks coated with blacking. While chilling or densening effect is less severe than that from iron chills, there is no risk of fusion or of blowing which might occur with dirty or improperly coated metal chills, and chill life of the silicon carbide blocks is quite long.

* * *

NECESSITY for thorough mixing of bonding agent in molding sand, whether it be in the form of new sand or as clay or bentonite, is shown in the experience of one foundry. For years the foundry added combinations of these materials to the heap sand, which was reconditioned with a sand cutter by the night gang. Recently a new reconditioning unit, including vibratory screen, magnetic pulley and muller, was installed. Testing of the sand revealed that the green strength was nearly twice that of sand treated by the former method.

* * *

MAJOR cause of gassing during the firing cycle in the dry-process enameling of gray iron, is the evolution of carbon oxide gases from the surface of the iron, according to Porter and Rosenthal in a paper presented at the annual meeting of the American Society for Metals. The gasses come from a reaction between carbon from the iron and oxygen supplied by the atmosphere, and evolve soon after the enamel is molten, with the evolution increasing in intensity and then finally ceasing after a period of time dependent on the furnace temperature. Hydrogen absorbed during melting does not cause gassing when gray iron is enameled, but hydrogen absorbed from extensive rusting or electrolytic treatments prior to enameling can cause defects.

* * *

SOLIDIFICATION of molten metal occurs in much the same way as the formation of snow by artificial "cloud seeding" techniques, according to two scientists of General Electric Research Laboratory, Schenectady, N. Y. In a paper jointly prepared for delivery at the American Chemical Society's nucleation symposium at Northwestern University, Dr. David Turnbull and Dr. Bernard Vonnegut said metallurgical research at the laboratory has revealed that solidification of molten metals occurs when metal crystals form on foreign nuclei in the melt. The foreign nuclei are so similar in shape and atomic structure to the metal crystals, that the crystals are "fooled" into collecting on the nuclei. For example, aluminum contains tiny crystals of titanium carbide which are very similar to aluminum crystals, and act in the same way as silver iodide in cloud seeding. Without such crystals, solidification would not start unless the material is cooled far below the melting point.

* * *

LIMITED area for unloading sand on the trestle at the west side of Allis-Chalmers No. 1 foundry makes it necessary to place the sand conveyor at the end of the gondola cars. This arrangement results in a 4-ft gap between the car and the conveyor. Because of this gap, considerable sand, especially when dry, would leak through the jaws of the grab bucket during unloading operations and pile up on the trestle. To bridge this gap, Badros Ohaman, a crane man, suggested a portable cover made of 16-gauge sheet metal. It is 48 in. wide and 54 in. long, with the ends bent over to serve as a lock. Now seeping sand lands on the cover, making it quite simple to shovel the sand into the conveyor hopper. Besides saving sand—in some instances up to 5 tons per car unloaded—use of the cover saves time formerly required in sweeping the trestle.

* * *

SOUTH African foundries are becoming quite interested in numerous applications of expanded or exfoliated vermiculite, according to the October, 1951 issue of *Engineer and Foundryman.* These uses include lining of coke-fired crucible furnaces for nonferrous melting with a mixture of 50 per cent red sand and 50 per cent vermiculite (minus 6, plus 10 mesh); as a mold wash for brass and bronze castings; as a core and chill wash; a vermiculite wash sprayed on metal screening and used on heads and risers of nonferrous castings to permit knocking them off; mixing vermiculite with molding and core sand to minimize cracking or tearing of castings; mixing with 50 per cent molding sand to ram up around risers to form insulating sleeves, and using vermiculite alone as a cover on feeding heads or risers.

* * *

IMPROVED process for producing a hard, wear and corrosion resistant alloy iron casting is cited in U. S. Patent No. 2,567,791. Iron containing about 2.5 to 3.0 per cent TC, 7.5 to 9 per cent Ni, 3.5 to 4 per cent Cu, 2 to 2.5 per cent Cr, and 1.75 to 2.25 per cent Si is subjected to a thermal treatment comprising heating the casting to a temperature of 1600 to 1800° F, rapidly cooling to a temperature below about 900° F to soften to a machinable hardness level of about 180 to 250 brinell, and thereafter subjecting the casting to a hardening treatment at a temperature below about minus 70° F to harden the casting to a hardness of at least 450 brinell.

Low Gas Formation

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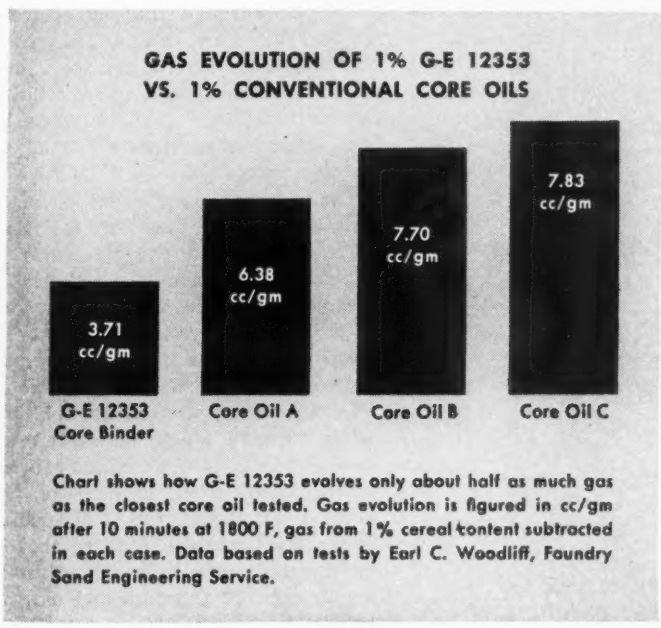

Chart shows how G-E 12353 evolves only about half as much gas as the closest core oil tested. Gas evolution is figured in cc/gm after 10 minutes at 1800 F, gas from 1% cereal content subtracted in each case. Data based on tests by Earl C. Woodliff, Foundry Sand Engineering Service.

Now you can produce sounder castings and reduce scrap loss due to blow-holes by using General Electric's new core binder, G-E 12353. This phenolic resin binder evolves considerably less gas than ordinary core oils; and since, in most applications, only *half* as much resin as oil is needed to give cores equal strength, gas formation is still further reduced with G-E 12353.

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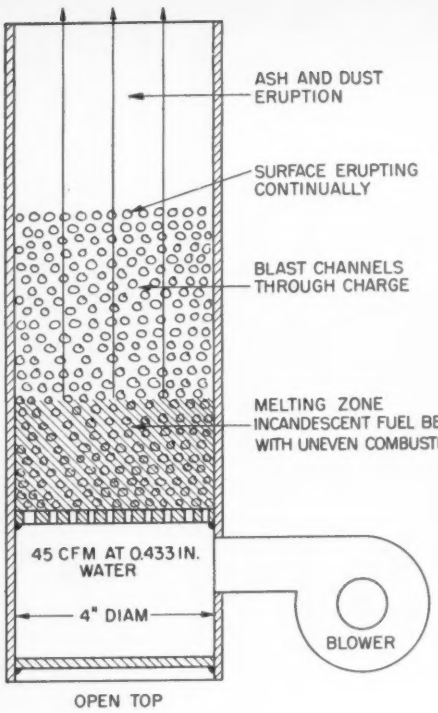


Fig. 1 — Experimental cupola operating with an open top

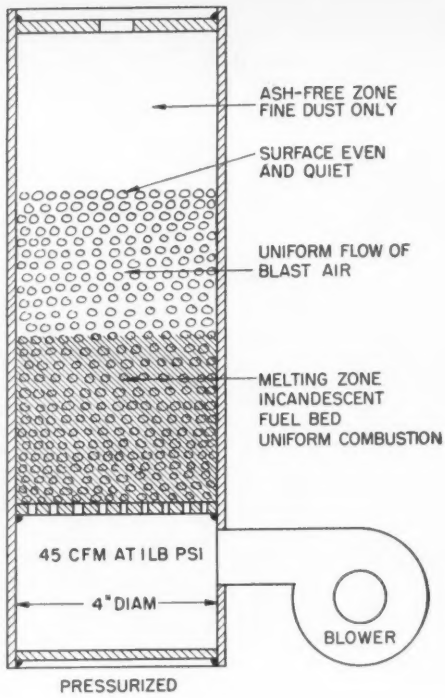


Fig. 2—Conditions when cupola operates under pressure

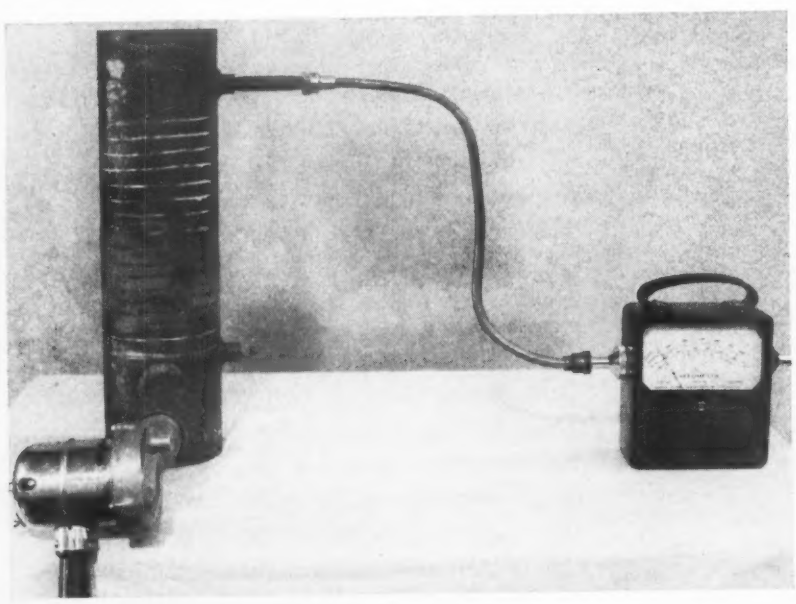


Fig. 3—Model cupola designed to burn rice-size anthracite. White lines on outside of the shell define combustion zones

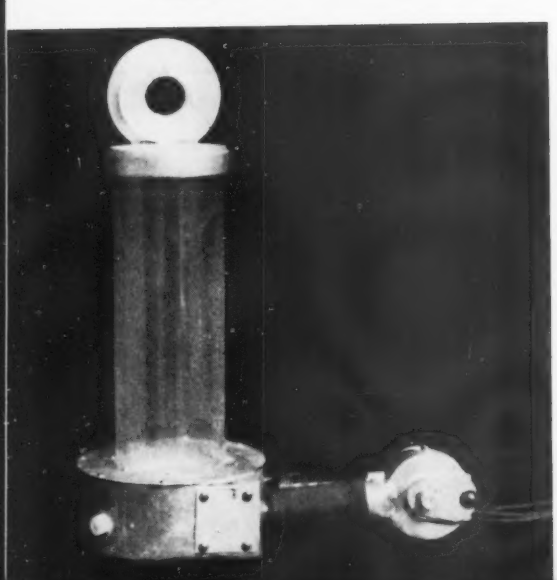


Fig. 4—Transparent cupola with various sizes of orifice rings

Develop

THREE important factors promote good melting in cupola operation: 1. Correct volume of air at all times. 2. Sufficient voids in charge to permit the air to contact all coke surfaces, thus promoting uniform air distribution. 3. Time for the air to make good thermal contact with the coke. These factors are nullified if the air velocity through the charge is execessive and the air is not distributed uniformly through the charge. Air velocity and air distribution are inter-dependent.

Numerous attempts have been made to obtain more intimate contact of the air with the coke and more uniform distribution of the air through the charge. In most of the attempts to solve the problem, it was assumed that if each tuyere handled the same volume of air, uniform distribution of the air through the charge would result. Therefore, many changes in windbox and tuyere design were made which were successful in distributing the air uniformly to the tuyeres, but little improvement was noted beyond the tuyeres.

The old-time puddler let down the flap damper on top of his stack while he puddled the slag into the ball. This gave a hotter and soaking heat. While operating a cupola years ago, the author observed that frequently the blast broke through the charge violently at different points. The damper on top of the old puddling furnace stack suggested that the fire in the puddler's furnace burned under a slight pressure. This seemed to account for the soaking heat. The pressure retarded the flow of air and gave more time for the air to contact the fuel and slag and to equalize the air flow.

Carrying out this analogy in the cupola, the author tried to simulate the conditions that prevailed in the puddling furnace by the simple expedient of covering the top of the cupola charge with flat pieces of stove plate weighted down with heavy pieces of scrap to create back pressure. The speed of the blower was increased to provide the same volume of air. This gave hotter iron and produced better heats and encouraged the author to continue the experi-

By ERNEST F. FISHER

Pressurized Cupola

ments in another foundry of which he was superintedent.

From this experimental work was evolved the pressurized cupola shown in Fig. 5. The top of the cupola is covered with a removable orifice ring of predetermined size through which the gases of combustion must flow at high velocity. This ring is analogous to the flat pieces of stove plate used in previous experiments. The high velocity through the orifice ring creates a static pressure within the furnace corresponding to the velocity through the orifice. The ring is of such a diameter as to create the desired pressure. Whatever the conditions within the stack, the velocity through the charge is governed by the orifice ring.

This process can be likened to that of an air receiver being filled with air at a constant pressure while air from the receiver is being discharged through a calibrated orifice at constant velocity. Pressure in the receiver at all times will correspond to the velocity through the orifice. Should the receiver be filled with material similar to a cupola charge, the air pressure surrounding each particle will be the same and the air flow through the voids will be uniform and governed by the velocity through the orifice.

Since the standard cupola in its present form is a vertical shaft furnace open at the top to the atmosphere, it is impractical to operate it at a pressure greatly in excess of atmospheric pressure. When the pressure exceeds a well defined limit, the difficulties that we seek to avoid are intensified.

Pressure at which the open top cupola operates is due to back pressure in the stack caused by the resistance to the flow of air through the charge. As the pressure increases, the velocity through the voids increases. The air will travel the path of least resistance. Some portions of the charge will receive little air and other portions will receive too much air. This unsatisfactory condition is intensified when the coke and iron are not sized uniformly.

In the pressurized cupola, the form and shape of the windbox and tuyeres are of minor importance. These adjuncts serve the same purpose as the pipe from a compressor to the air receiver. The whole system is under the same static pressure from the windbox to the orifice ring. This produces uniform air flow through the voids and reduces the air velocity so that each particle of coke and iron is surrounded by an envelope of gas, thereby promoting better heat transfer. The only operating variable to contend with is the pressure and this is governed by a pressure control on the blower.

A cupola oftentimes and mistakenly is likened to a blast furnace. There are important differences. A blast furnace is essentially a carbon monoxide generator and melting furnace combined in a closed system. A cupola is an open top melting shaft with only one purpose—to remelt iron and to an extent refine it and produce an alloy of iron of desired analysis. The top temperature of a blast furnace rarely exceeds 350° F. The top temperature of a cupola often exceeds 800° F. This high temperature makes it difficult to employ standard cleaning equipment for suppressing cupola dust and smoke. Obviously, it is all the more important to operate a cupola in a manner so as to produce a minimum of dust and smoke.

A more or less dustless condition prevails when the cupola is operated in a closed system for the purpose of reclaiming the waste heat for preheating the blast. It is impractical and uneconomical to operate a cupola under blast furnace techniques unless it is operated continuously over long periods and the waste heat is used to preheat the blast. That type of cupola would be too costly for the average foundry. The pressurized cupola is designed as a medium between the open top cupola and the more costly closed type system.

The following advantages are claimed for the pressurized cupola:

1. Coke size need not be uniform.

(*Concluded on page* 154)

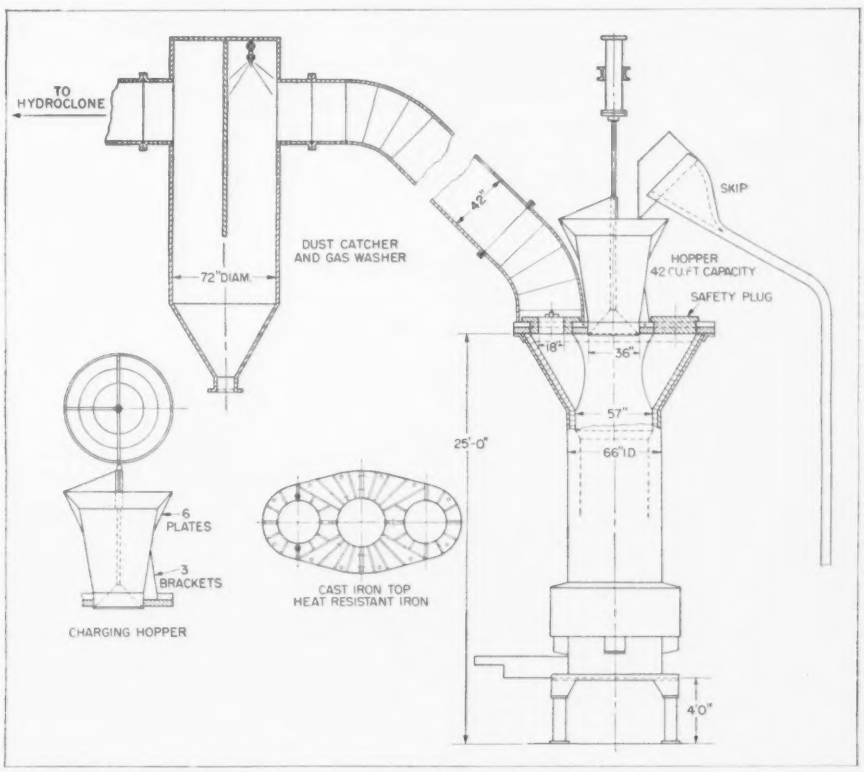


Fig. 5—Sketch showing details of the pressurized cupola

(*Concluded from page 153*)

2. Savings in coke.
3. Less dust and fly ash due to decreased velocity through charge.
4. Ease of control of air volume.
5. Uniform erosion of lining.
6. Greater density of charge can be used.
7. Less bridging and channeling.
8. Better results with enriched blast.
9. More efficient preheat of top charges because of decreased velocity.
10. Better combustion.
11. Uniform melting.
12. More fluid iron.
13. Better control of carbon.
14. Greater possibilities in making nodular iron.

Some interesting experiments have been made with models of the pressurized cupola. Fig. 4 shows a transparent cupola with various sizes of orifice rings. The air flow through the charge was graphically illustrated. Further experimental work has been done with the small cupola shown in Figs. 1, 2 and 3. This cupola, designed to burn rice-size anthracite coal, was not intended to melt iron. It was intended only to observe combustion conditions under varying differences of pressure.

White lines drawn on the outside of the shell 1 inch apart define the zones of combustion in the cupola operating under open top and pressurized conditions. The color scale was an approximation of the temperatures in the combustion zone. When the shell reached a bright cherry color, the temperature was in the range of 1500 to 1650° F. From orange to yellow the temperature was in the range of 1650 to 2000° F. The temperature was not permitted to rise high enough to distort the shell.

Fig. 1 shows the cupola under open top conditions during which the combustion was spotty as indicated by the degrees of color on the shell. Much ash and fuel were thrown out and holes were blown through the charge of fuel. The fuel bed gradually burned higher until finally it reached the top.

Fig. 2 shows the cupola under pressurized conditions during which combustion was uniform as shown by the uniform color of the shell from orange to yellow. Combustion occurred only in the bed. The fuel above fed down as the bed burned and the combustion went no higher than the line 7. There was no eruption of the surface of the fuel and no ash or fuel was thrown out. Very little carbon monoxide was present in the upper part of the stack as was the case in Fig. 1.

The model cupola with transparent shell shown in Fig. 4 was used to demonstrate the air flow under different pressure conditions which agree very closely with actual conditions of combution produced in the setup shown in Figs. 1, 2 and 3.

It is obvious that more power will be required to operate a cupola under pressurized conditions. A pressure of 5 psi is recommended for cupolas lined to 60 inches and over. Tapping conditions will also change with the added hydraulic head of metal and the shell and bottom doors will have to be designed for the increased pressure.

The time is coming when large production foundries will find it advantageous to install pressurized cupolas and approach more closely the techniques of blast furnace operation with its economies.

Work Measurement Films

Work Measurement Films—Unit II, consisting of six reels of 16-mm silent black and white film have been prepared by Prof. Ralph M. Barnes and are being distributed by Wm. C. Brown Co., 915 Main St., Dubuque, Iowa. The films are intended to serve as standards in helping to determine work speed and to acquaint the uninformed with time study methods and procedures. They are available for purchase or rental.

Book Review

Transactions of the American Foundrymen's Society; Vol. 59; fabricoid, 561 pages 8 x 11 in.; published by the American Foundrymen's Society, 616 South Michigan Avenue, Chicago.

This volume is a record of the proceedings of the 55th annual meeting of the society at Buffalo, Apr. 23-26, 1951, including the presentation of 61 technical papers with accompanying discussion. The volume also carries a copy of the annual address by President Walton L. Woody; report of secretary treasurer by W. W. Maloney; report of the technical director S. C. Massari; also reports of special and regular meetings of the board of directors held in July and September 1950, and January, April and July, 1951. The volume is indexed under subjects and authors.

BIRMINGHAM REGIONAL MEETING

Will Be 20th of Series

SOUTHEASTERN Regional Foundry Conference to be held at the Tutwiler Hotel, Birmingham, Thursday and Friday, Feb. 21-22, will mark the twentieth of the successful annual meetings sponsored by the Birmingham District Chapter of the American Foundrymen's Society.

Eight technical subjects will be discussed in the program arranged under the direction of Chapter Vice Chairman Fred K. Brown, Adams Rowe & Norman Inc. Morning of the second day will be devoted to plant visitation, and the annual banquet will be held Friday evening. I. R. Wagner, national AFS president, will be the speaker at the Thursday luncheon. Elliott M. Cranford and Joe T. Gilbert, Stockham Valves & Fittings, head a committee which has arranged entertainment for Thursday evening.

Registration for the conference will start at 9 a.m. Thursday in the Tutwiler lobby, where registrations for plant visits also will be made. W. K. Bach, Foundry Service Co., is chairman of the registration committee, and W. Guy Bagley, Woodward Iron Co., heads the greeters committee.

Other committee chairmen are: J. P. McClendon, Stockham Valves & Fittings, publicity committee; Donald C. Abbott, Hill & Griffith Co., membership committee, and T. H. Benners, T. H. Benners & Co., educational committee. Charles K. Donoho, American Cast Iron Pipe Co., is chapter chairman.

Program details follow:

Thursday, Feb. 21

9 a.m.—Registration

10 a.m.—Opening session
"Castings vs Weldments," Paul Stuff, Ross-Meehan Foundries Inc., Chattanooga, Tenn.; "Comparison of Core Binders," Warren C. Jeffery, University of Alabama, Tuscaloosa, Ala.

12:30 p.m.—Luncheon: presiding, Fred K. Brown, Adams Rowe & Norman Inc.; address of welcome, Commissioner Eugene Connor; "Your American Foundrymen's Society," I. R. Wagner, vice president, AFS

1:45 p.m.—"The Why of Gate and Feeder Design in Castings," Fred G. Sefing, International Nickel Co., New York

3 p.m.—Core show, Stockham Valves & Fittings, Birmingham; demonstration of coremaking

4:30 p.m.—"Cupola Deoxidation Improves Machinability," Frank Kleeman, foundry consultant, Pittsburgh

8 p.m.—Entertainment: E. M. Cranford, chairman; Joseph T. Gilbert, co-chairman

Friday, Feb. 22

9 a.m.—Plant visitation (arrange at registration desk in lobby of hotel)

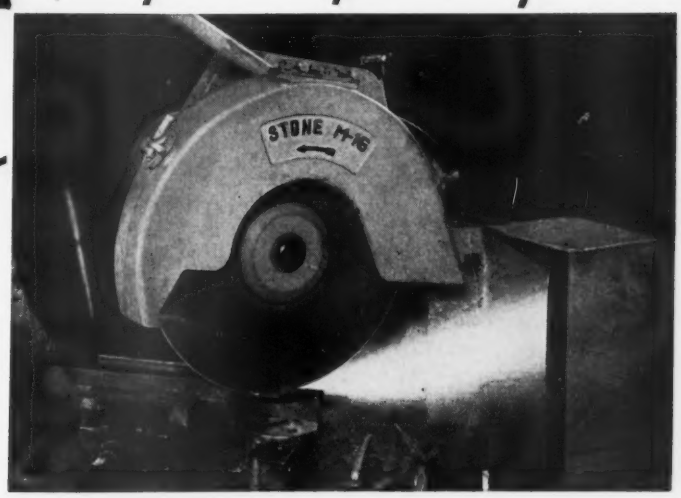
1:30 p.m.—"Sources of Trouble in Cupola Operation," Walter Jaeschke, Whiting Corp., Harvey, Ill.

3 p.m.—"Foundry Modernization," Raymond H. Moore, Claude B. Schneible Co., Detroit

4:30 p.m.—"Quality Control," Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

7 p.m.—Banquet: speaker to be announced

THREE CUTS IN ONE



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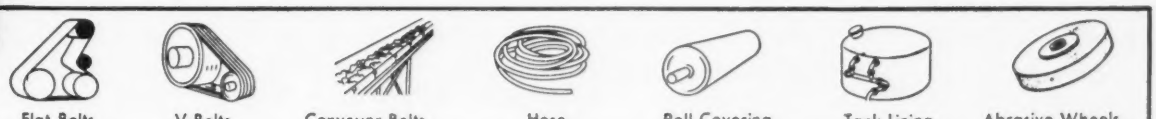

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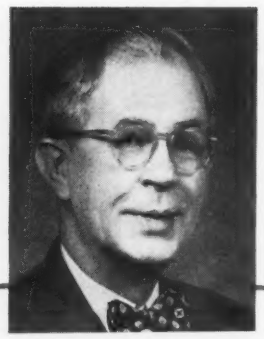
MAN-TO-MAN

on the Molder's Bench

"Little Grains of Sand"



By RALPH L. LEE

MET a fellow on the train the other day who was coming back from Washington where he'd been working with a group who were trying to herd up scrap from all over the country. He was lecturing me on how much the whole defense program could be stymied by the lack of scrap and how they were racking their brains for schemes and stunts for putting burrs under the tails of shop and foundry people.

I told him that he and his pardners sure must be working overtime, for it seemed to me that everything I picked up to read was plastered all over with flag-waving and table-pounding on the drastic need for scrap. I added that I'd even seen a high-pressure picture on the television.

His face didn't light up with my report as much as I thought it would, for he merely commented that, in spite of all they'd been doing, the stuff wasn't coming in fast enough. "How do you know?" I asked.

"What do you mean—how do I know?" He sort of bristled back. Not wishing to start an argument I said, "I was just wondering whether you scrap fellows in Washington have any way of knowing how much scrap there is lying around all over the country, although for the life of me I don't see how in the world you could find out."

He said that he personally did not know, but he imagined that some of the other folks there in Washington must have statistics on scrap along with their figures on almost everything else. Still not trying to start an argument but just by the way of something to talk about I said, "It just struck me this moment that so much of all this publicity might give the public the wrong impression about shop people and particularly about foundry people."

"In what way?" he asked.

"Well look!" I said. "Suppose these statistics in Washington (if any) were cockeyed and there just wasn't enough scrap lying around in foundries for a fellow to bother sending in. Wouldn't all of this pleading on bended knee give the public the idea that foundrymen didn't give a tinkers-dam."

"Hold everything!" my scrap man said, "you've given me an idea."

"Idea?"

"Yeah, you just got through saying, and I quote, suppose most foundrymen didn't have enough scrap lying around worth bothering to send in."

"Go ahead," I said.

"All right—here we've been running ads built around the millions of tons of scrap needed for national defense, and reading these ads are folks in hundreds of little shops and foundries with only ounces and pounds of scrap at hand, hidden here and there."

"You mean," I interrupted, "that these little fellows might just take for granted that all of these million-tons ads are aimed at the big boys and not at them?"

"Right," he said. "While I admit that I personally don't have statistics, I'd be willing to bet that if all the scrap not worth bothering to send in, did come in, we'd be over the hump in short order. Holy Smoke," he yelled as he grabbed his hat, coat and bag to dash off at the "all-aboard" call.

When I got back home, said hello to Mother, changed my clothes and punched the clock into the Lee Hobby Foundry, I took up this scrap situation. I started off on a slow trip through the place with a fine-tooth comb. As I went along, the trip got slower and slower, for it seemed to me that every candidate or suspect for the scrap pile got up on its hind legs to fight me.

That vitreous enameled wash tub from our old washing machine up in the loft put up a strong defense—I'd been saving it to make a muller out of it some day. Then there was that blower housing casting a fellow gave me; I thought I'd make a new impeller for it and give it to my son Ralph to carry off the sawdust and shavings from his cabinet shop.

Quite a flock of short pieces of bar stock and angles from the cut-off saw gave me quite a tussle—you never know when they might come in handy. So did half of a water tank (one of those kitchen hot water tanks) I'd been saving for over ten years for something—I can't quite remember what it was.

I just couldn't let go of the middlin' little amount of brass scrap I have left; it's the only brass I've got.

Maybe I can spare a little of my steel scrap for the cupola, although it's a question—but I'm right down on my uppers when it comes to gray iron as I don't have enough pig left to shake a stick at. After all, a foundryman buys scrap.

When I got through with this expedition I must admit that I didn't have a very big pile of scrap—certainly not enough to call the scrap man—so I'm taking it down to the yard myself.

I don't feel like a hero or what you might say patriotic, but the effort was well worth while as I look back on it. It started sort of a chain re-

(*Concluded on page* 158)

World's Largest
JOLT-SQUEEZE-STRIP MACHINE

Massive copes and drags of uniform standard are produced by the new 15-ton **SPO** Model 2364 jolt-squeeze-strip machine. Featuring **push-button control,** it is semi-automatic.

Machine is designed for **efficiency of operation, high production capacity and operator safety.** Squeeze head is power operated . . . jolt cycle is timer-controlled . . . squeeze cycle regulated by pressure switch . . . and two-speed vibrating and stripping operations automatically controlled.

Model 2364 has a squeeze capacity of 80,000 pounds, jolt of 4000 pounds and pattern draw of 14 inches. Flask space ranges up to 54 inches, left to right, and to 50 inches, front to back. Machine stands 166 inches overall and is recessed into floor 50 inches.

Write today for Bulletin No. 2000 for complete data.

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(*Concluded from page* 156)
action which led to a general inventory. Mother said that even in running the house you've got to take inventory every so often. Well anyway, "I seen my duty and I done it."

After telling my good friend John Linabury about the scrap drive in the Lee Hobby Foundry he said that another helpful move would be not to make so much scrap. I sorto' reared up at this till he said, "Naw I wasn't just picking on you, but if everyone figured their heats a little more carefully in line with the molds they had to pour, and went after their gating and risering problems with a little more spunk, they'd have less scrap within the shop, less remelting and less coke, coal, gas or oil. And," he added, "there might be fewer extra castings sitting around made in anticipation of the scrap they thought they might make."

You know, it's funny how most big problems can be broken down into little doable pieces. The older I get, the fewer rabbits I see truly big people pulling out of their hats. It just looks as though most of the outstanding accomplishments come about through common ordinary means.

ELECTRIC FURNACE STEEL CONFERENCE

Draws Record Attendance of Nearly 750

By EDWIN BREMER
Metallurgical Editor
FOUNDRY

LARGEST attendance on record—nearly 750—marked the ninth annual Electric Furnace Steel Conference at Hotel William Penn, Pittsburgh, Dec. 6-8. Meeting was sponsored by the Electric Furnace Steel Committee of the Iron and Steel Division, American Institute of Mining and Metallurgical Engineers under the direction of T. J. McLoughlin, U. S. Steel Co., Pittsburgh, as chairman. R. H. Frank, Bonney-Floyd Co., Columbus, O., was chairman of the committee for the conference.

New officers elected for the next conference, to be held Dec. 4-6, 1952, at Pittsburgh, include Mr. Frank, who was elected chairman of the Electric Furnace Steel Committee and W. M. Farnsworth, Republic Steel Corp., Massillon, O., and F. O. Lemmon, Ohio Steel Foundry Co., Springfield, O., who were elected chairman and vice chairman, respectively, of the committee for the tenth Conference.

At the opening session under the direction of T. J. McLoughlin and W. M. Farnsworth as chairmen, "Alloy Availability and Regulations" was discussed by Fred R. Franklin, National Production Authority, Washington, who pointed out that at present nickel is the most critical of the several alloying materials. Edward L. Solomon, Max Solomon Co., Pittsburgh, in discussing the outlook for electric furnace scrap, said that the latter part of December and the first part of 1952 would be periods of the greatest shortage of scrap. He pointed out that electric steel foundries require steel cut to short lengths and segregated by type, but since no differential in price is permitted, scrap dealers do not want to carry on such operations. He recommended that foundries install shears to cut the scrap into desired lengths.

In the afternoon session with R. H. Jacoby, Key Co., East St. Louis, Ill., and Gerhard Derge, Carnegie Institute of Technology, Pittsburgh, presiding, Ralph Carlson, American Cast Iron Pipe Co., Birmingham, Ala., presented a paper prepared by his coworker, Sam F. Carter, on the use of calcium carbide for the removal of sulphur. In this process fine calcium carbide is blown under the surface of the molten bath by pressure of an inert gas. Gases used include argon, nitrogen and carbon dioxide. In producing acid electric heats the author indicated that the additional cost of using carbide appears to be equal to or less than the cost of basic electric double-slag practices, accomplishing compable desulphurization. In basic melting, carbide injection would be faster and more direct than conventional reducing practice.

Etienne Spire, L'Air Liquide, Montreal, Que., discussed a procedure for reducing hydrogen and nitrogen in molten steel baths by injecting argon gas through a porous plug in the ladle bottom. He said this procedure causes considerable agitation at the surface of the bath, and by use of a suitable lime slag, sulphur content also can be reduced.

Friday morning's discussion on acid and basic practice for casting was directed by C. E. Sims, Battelle Memorial Institute, Columbus, O., and Clyde Wyman, Burnside Steel Foundry Co., Chicago. James T. Gow presented a paper on "Basic Electric Arc Furnace Metal For Castings Production," which was prepared in cooperation with Vincent E. Belusko. Both are with Electric Steel Foundry Co., Portland, Ore. After describing in detail the melting procedure, the authors pointed out that the basic practice permits high recovery of such alloying elements as chromium, manganese, columbium, etc. No difference was found in the chemical or physical properties of stainless steels in acid and basic melting if the composition of the metals is substantially the same in respect to all elements. However, they found that the better composition control possible with basic melting made it easier to produce certain consumers' specifications for which narrow limits for most elements must be obtained.

A paper giving detailed information on the basic electric melting process prepared by Alexander Finlayson, Pacific Car & Foundry Co., Renton, Wash., was presented in abstract form by Charles W. Briggs, Steel Founders' Society of America, Cleveland.

I. W. Sharp, American Steel Foundries, Verona, Pa., stated that a comparison of acid and basic furnaces in his plant indicated there is little difference in the ease of meeting chemical specifications in the two practices. At a given mold-entering temperature, single slag basic electric grade B steel has less spiral fluidity than does acid electric steel of the same chemical composition. This difference in spiral fluidity is greatest at low mold-entering temperature and decreases as mold-entering temperature increases. Roof costs of the acid furnace are $23.44 higher than that of the basic furnace, and furnace lining costs of the basic furnace are $381.95 higher than on the acid furnace.

Donald Helman and F. O. Lemmon, Ohio Steel Foundry Co., Springfield, O., gathered data during a nine-month period of operating acid and basic lined furnaces of the same size, and concluded that the increase in time of melting cycle and higher refractory and material cost for basic practice did not warrant continuance of such practice since it did not improve casting quality. The authors believe that a careful study of mold conditions and design of the casting will do more to improve quality than will a change to basic melting practice.

Chairmen of the session Friday

(*Concluded on page* 160)

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(*Concluded from page* 158)
afternoon were H. H. Blosjo, Minneapolis Electric Steel Casting Co., Minneapolis, and H. H. Johnson, National Malleable & Steel Castings Co., Sharon, Pa. First portion of the program was devoted to a discussion of refractories for acid electric steel melting furnaces by M. W. Demler and J. A. Pierce, Harbison-Walker Refractories Co., Pittsburgh, and by G. S. Kennelley, P. M. Mordaunt, and C. E. Grigsby, General Refractories Co., Chicago. Remainder of the session was devoted to a discussion of analytical procedure for residual elements for control purposes, and included the following papers: "Methods for Preliminary Chemical Analysis of Carbon, Chromium and Molybdenum" by R. H. Jacoby, Key Co., East St. Louis, Ill.; "Preliminary Analysis for Carbon, Phosphorus and Sulphur in Steel," by L. H. Arner and H. H. Johnson, National Malleable & Steel Castings Co., Sharon, Pa., and "Analytical and Wage Standardization in the Chemical Laboratory" by C. M. Nettles, Texas Electric Steel Casting Co., Houston, Tex. The latter was presented in abstract form by John B. Caine, Wyoming, O.

Saturday morning's session was an educational one devoted to a discussion of the procedure of making a heat. It consisted of a panel discussion with a moderator who propounded questions relating to the various steps. Topics in order of occurrence began with preparation of the charge, charging, electrode manipulation on through to tapping practice, ladle practice and furnace maintenance. Moderator was Charles W. Briggs, Steel Founders' Society of America, Cleveland, and panel members included Leland Peterson, Timken Roller Bearing Co., Canton, O.; Harold Green, U. S. Steel Co., Duquesne, Pa.; E. C. Eiffler, American Steel Foundries, Verona, Pa.; Charles A. Faist, Burnside Steel Foundry Co., Chicago, and F. Vihtelic, Michigan Steel Casting Co., Detroit.

AMA Issues Pamphlets

American Management Association, 330 West 42nd St., New York 18, has published four new pamphlets priced at $1.25 each. In the general management series are booklets 152, dealing with "New Perspectives on the Administrator's Job," and 153, "Management Planning Under Mobilization." In the packaging series are booklets 36, "How Industry Is Solving Its Packaging Problems," and 37, "Military Packaging Requirements" combined with "Outlook for Materials and Equipment."

Book Review

Work Measurement Manual, by Ralph M. Barnes, 4th ed., paper, 304 pages, 8½ x 11 in., published by Wm. C. Brown Co., Dubuque, Iowa. Price $4.75.

Importance of time study, the procedure commonly used in making a time study, the work measurement investigations now being conducted by the author, and some of the preliminary findings are presented. The manual describes in detail how an organization may check the ability of its time study men to set time standards and to improve the accuracy and consistency of such standards. It also explains how these standards may be compared with the "national standards" being developed by Professor Barnes.

Other sections of the book tell how to conduct a community time study survey and how to use standard motion-time data for various factory operations. A time study training program and a foreman's time study manual are described.

Meetings of Interest to Foundrymen

Feb. 7-8—Wisconsin Regional Foundry Conference, Wisconsin Chapter, AFS, and University of Wisconsin, Hotel Schroeder, Milwaukee

Feb. 14-15—Foundry Educational Foundation, technical and university advisory committees conference, Hotel Statler, Cleveland

Feb. 21-22—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama student Chapter, AFS, Tutwiler Hotel, Birmingham

Feb. 22—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Feb. 25-26—Materials Handling Conference, Purdue University, West Lafayette, Ind.

Feb. 25-28—Industrial Ventilation Training Course, sponsored by Michigan State College and Michigan Dept. of Health, at the college, East Lansing, Mich.

Mar. 3-7—American Society for Testing Materials, spring meeting, Statler Hotel, Cleveland

Mar. 7—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

Mar. 18-19—Steel Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Mar. 28—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Mar. 31-Apr. 2—American Institute of Mining & Metallurgical Engineers, national open hearth conference, William Penn Hotel, Pittsburgh

Apr. 10-11—Malleable Founders' Society, market development conference, Case Institute of Technology, Cleveland

Apr. 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Apr. 27-May 1—American Ceramic Society, annual meeting, William Penn Hotel, Pittsburgh

May 1-7—American Foundrymen's Society, International Foundry Congress and Show, Atlantic City, N. J.

May 6-9—International Lighting Exposition and Conference, Public Auditorium, Cleveland

May 14-16—Society for Experimental Stress Analysis, spring meeting, Lincoln Hotel, Indianapolis

May 16—Malleable Founders' Society, eastern sectional meeting, Commodore Hotel, New York

May 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 16-17—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 23-27—American Society for Testing Materials, annual meeting, Statler Hotel, and Hotel New Yorker, New York

July 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Sept. 8-10—American Standards Association, national standardization conference, Museum of Science & Industry, Chicago.

Sept. 8-12—Instrument Society of America, annual meeting, Cleveland

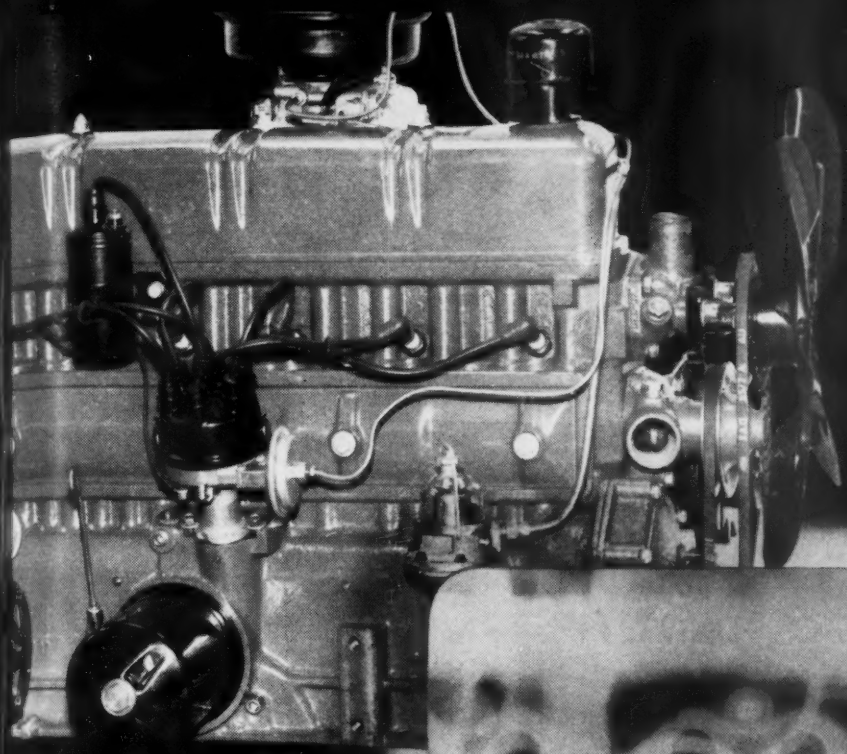
Oct. 16-17—Gray Iron Founders' Society, annual meeting, Hotel Cleveland, Cleveland

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-24—American Society for Metals, National Metal Congress and Exposition, Philadelphia

Nov. 19—American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York

Dec. 4-6—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, William Penn Hotel, Pittsburgh



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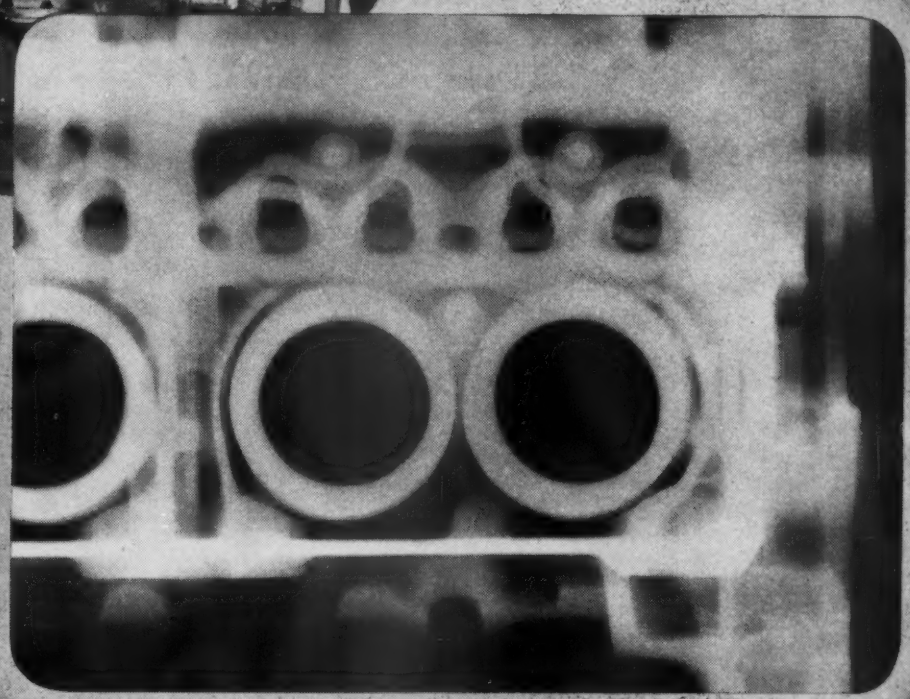

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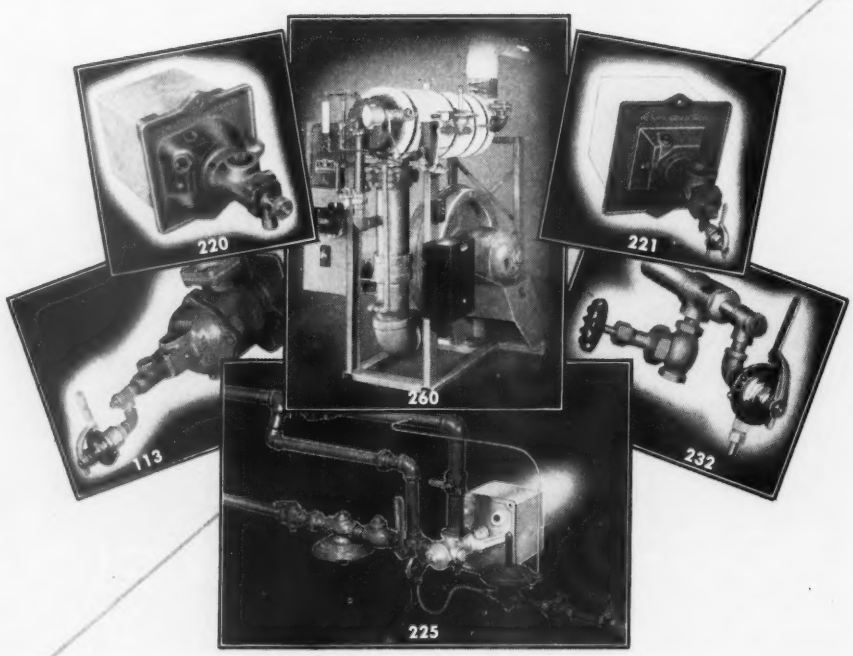

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Casting in Open Molds

(Part III)

By PAT DWYER, *Engineering Editor, FOUNDRY*

ABC of Foundry Practice

MANY factors which limit the use of the single gate on certain castings, do not apply to castings poured in open sand molds. Whereas a plate poured under a cope may require a row of branch gates along one or both sides or ends, the same plate may be cast in an open mold from a single gate. Gates on a coped mold are limited by the thickness of the casting. The stream of metal entering an open sand mold may be increased or decreased at the will of the pourer. Irons of various compositions and temperatures do not run with equal facility. Many a good casting has been lost or saved by the manner in which the metal was poured into the mold.

In early blast furnace days all gray iron castings were formed in open sand molds. An impression of the desired article was made in the pig bed sand which extended in front of the furnace. When the furnace was tapped the molten iron flowed into a long channel known as the sow, and thence into rows of short transverse channels at each side known as pigs. The castings were filled at the same time and in the same manner as the pigs. This probably is the first example of the single gate, the narrow passage between the central channel or sow, and each pig or casting.

Many castings still are made in open sand molds, but not nearly as many as might be made profitably if sufficient attention were paid the subject. In *The Iron Foundry Supplement, a Complete Illustrated Exposition of the Art of Casting in Iron,* published by John Wiley & Sons, New York in 1893, the author, the late Simpson Bolland, covers this subject in considerable detail. Whether the present generation is behind, or Mr. Bolland was ahead of his time, the fact remains that his chapter on gating leaves little room for improvement. He had a comprehensive knowledge of the principles involved and many years' experience in the practical application of these principles. Slightly abridged, his observations and instructions for gating open sand castings properly are set forth in the following:

"Many molds are covered at an augmented cost, which might have been saved by the founder or his customer, had the needed help for the production of the castings been on hand. Pouring constitutes the chief trouble with open sand work. When this is understood thoroughly good castings can be produced in open sand molds.

"Usual practice is to cut channels at intervals around the edge of the mold to regulate the thickness of metal in the casting. Flow of metal is supposed to be checked when the desired thickness is reached. This practice is unreliable. Usually more than one ladle is employed in pouring large plates. The feeling of uncertaintly which exists prevents unity of action. Almost invariably the plate is imperfect if not actually a total loss. It is either too thick or too thin, or perhaps thick at one area and thin at another area.

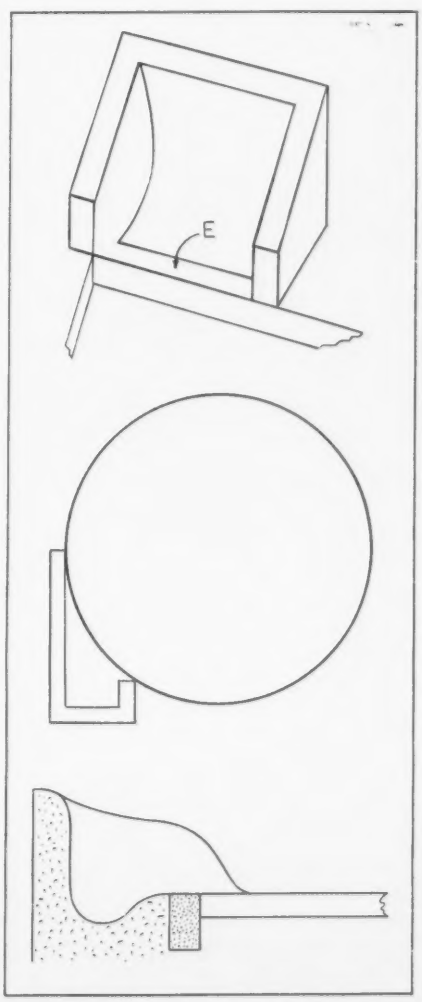

Fig. 1—Top—Runner basin for square or rectangular plate. Center—Runner for round plate. Bottom—Application of dry sand core

"The logical method is to take the correct amount of metal in the ladle and pour it into the mold where the sides are higher than the required thickness of the casting. A runner basin at one corner of a 7 x 7 ft plate convenient for quick handling of the metal is shown in Fig. 1, top, formed after the manner shown to permit a stream 2 ft wide with a gradually curving surface from the back to the front. To prevent the rushing iron from washing away the green sand edge, this part of the mold is formed with the dry sand core *E*, bottom.

"Correct amount of iron in the ladle is poured briskly down the incline of the runner basin. The wide stream will strike the opposite corner of the mold with sufficient force to drive it at right angles to the next corner and so on. Urged by the constant stream behind, the metal will whirl uninterruptedly around the periphery, and finally settle quietly and evenly over the entire surface. The thickness will be uniform, provided the mold surface is perfectly level, and the weight of the casting will be as anticipated. On a circular plate the same type pouring basin is set at a tangent (center Fig. 1), to strike the edge set up high as in the former instance. The metal in the mold rotates rapidly and gradually settles quietly and evenly."

In both these instances it is assumed that the bed has been prepared properly. A wet or hard bed will cause the metal to boil violently and produce a casting lumpy and scabby on the lower face, and on the top side looking like a piece of ice formed on a lake during a wind storm.

When an open sand casting presents some difficulty on account of ribs, hubs, lugs, brackets, pockets or other projecting members on the lower, or face side, advantage may be taken of the gating method shown in Fig. 2. By placing one or more of these gates at such locations as will provide a steady flow of iron into the mold, the greatest nicety of control may be exercised. Any degree of speed and pressure may be secured by increasing or decreasing the height of the runner basin *G*. The run-

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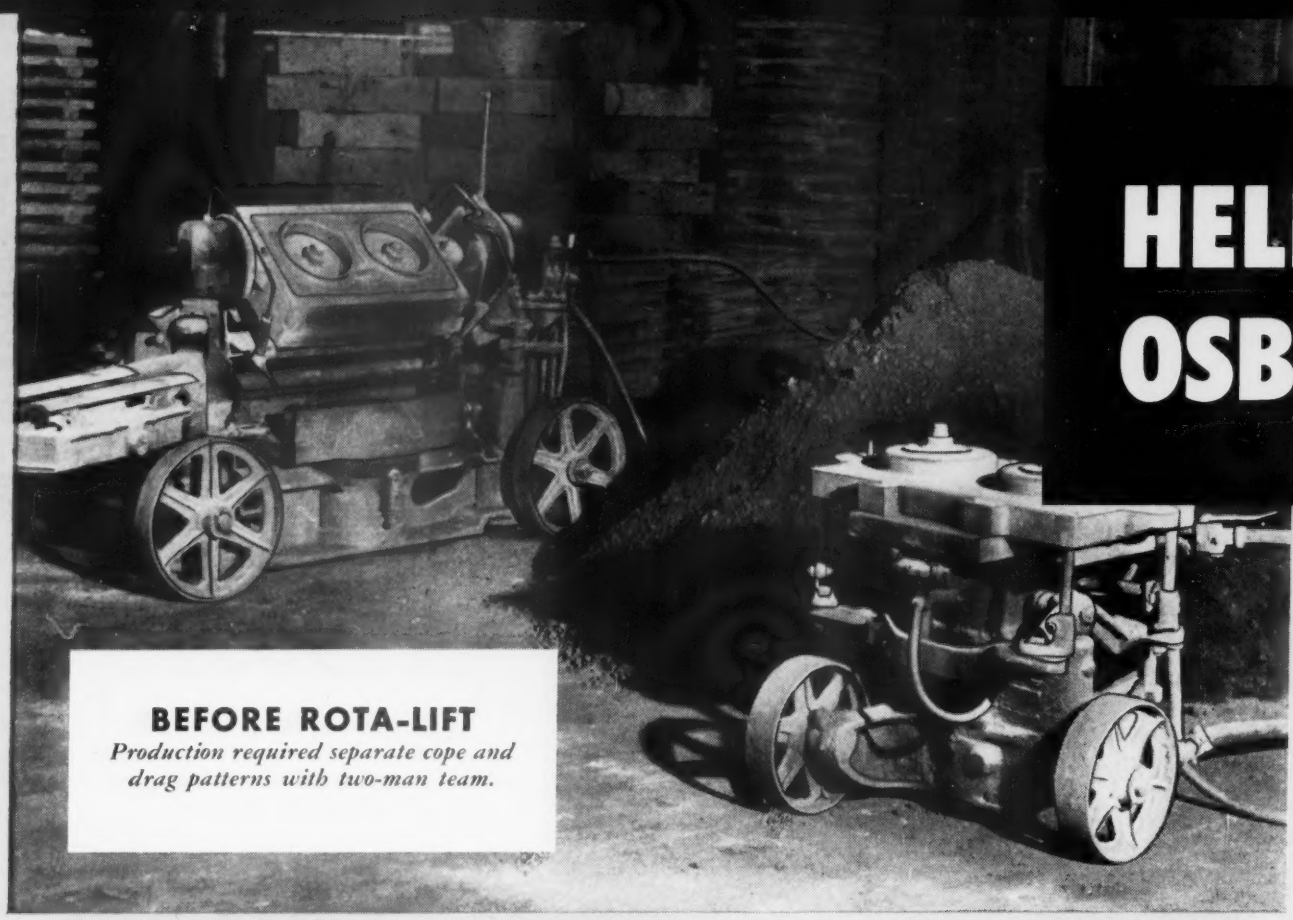

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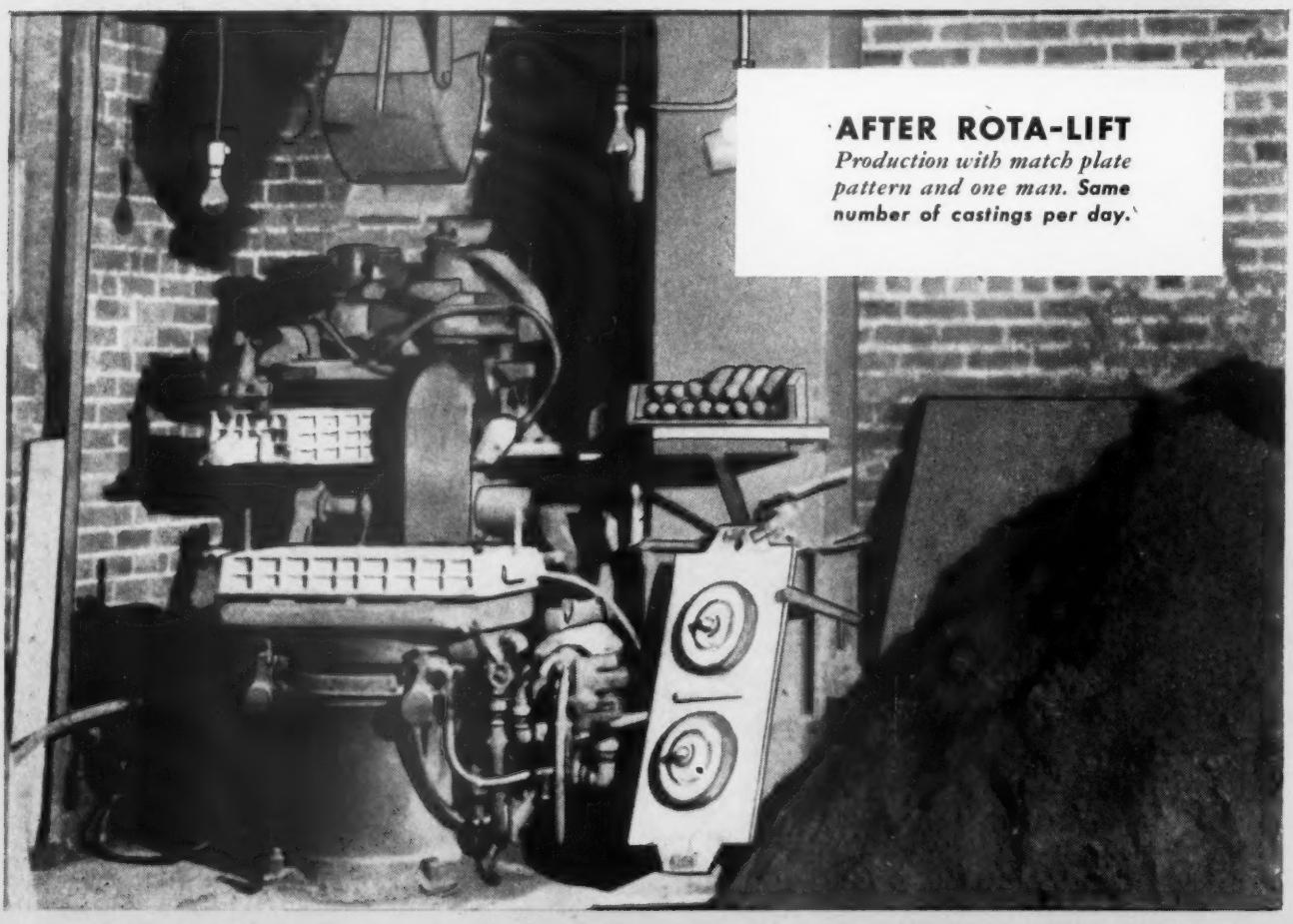

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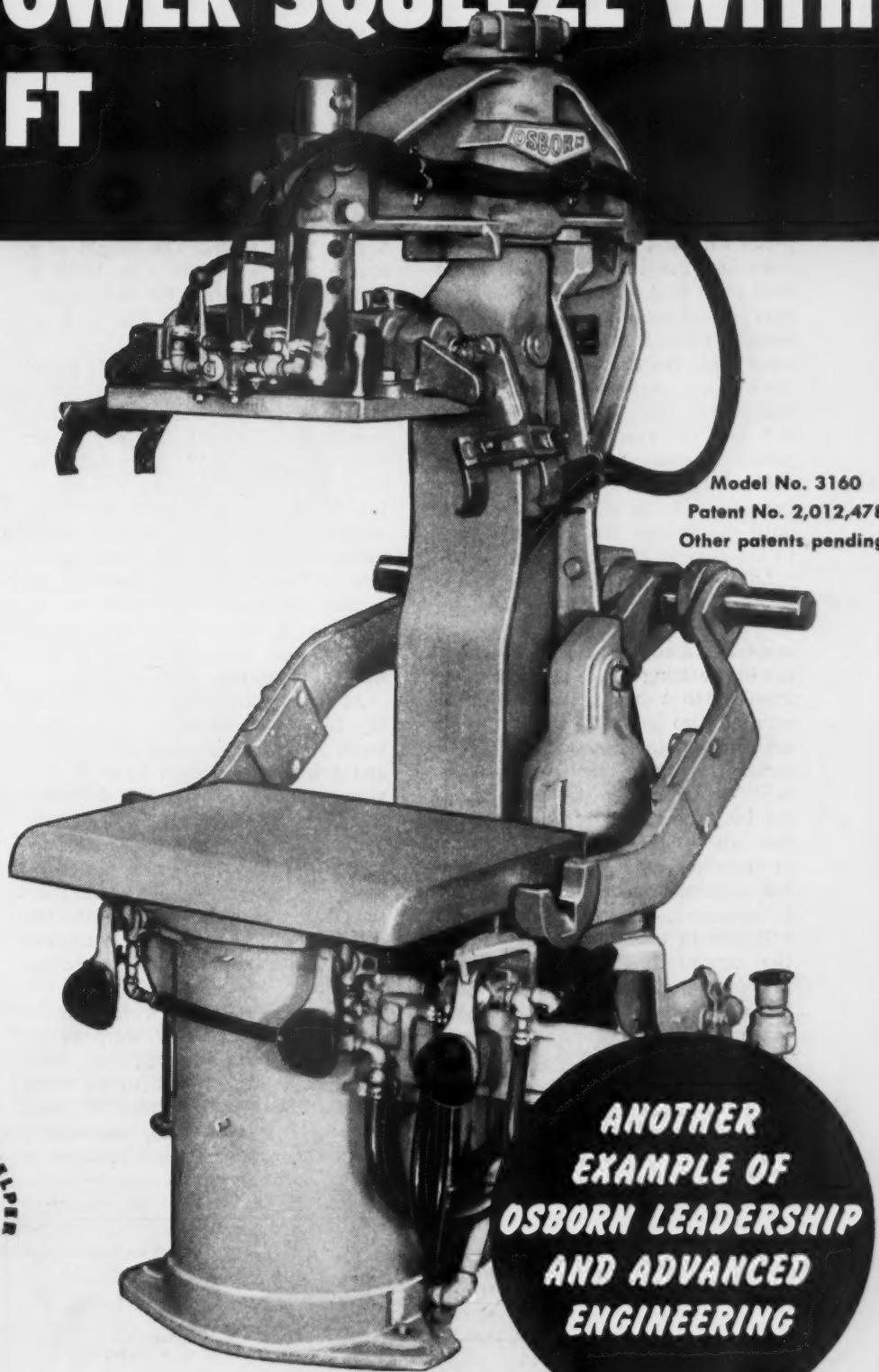

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(*Concluded from page* 163)

ner—that is, the lower channel in the gating system—may be formed in a dry sand core *K*.

Under usual shop conditions, where several molds are poured in succession from one ladle, and where ⅛-in. variation in thickness is not a factor of importance, open sand castings may be poured satisfactorily by intelligent manipulation of the ladle. The bottom of the pouring basin is filled gently. Then the ladle is tipped rapidly to drive a stream to the opposite side of the mold. If this were continued the metal would rise at that point and climb over the edge. This is prevented by restricting the stream of iron from the ladle immediately after the first flood has struck the opposite wall and has started to return. The ladle again is tipped rapidly and the result is that the opposing streams meet and neutralize each other's speed. A steady stream from the ladle then can be maintained until the iron in the mold has risen to the desired height.

Local conditions, including the relative importance of the casting, determine whether the walls of the mold are made to the exact height of the casting thickness, or built from ½ to 1 in. higher, with flow-offs at two or more points to indicate when the desired thickness of metal has been reached. In either case cognizance must be taken of the fact that, because of surface tension, the metal will rise ⅛-in., and in extreme cases ¼-in., higher than the confining walls before it begins to run over. Height to which metal will rise in this manner depends on the temperature, or perhaps more properly speaking, the fluidity. Some irons are more fluid than others at a given temperature.

For the benefit of beginners, and perhaps for others who up to the present have not familiarized themselves with the subject and who may want to adopt the method advocated of taking the correct amount of metal in a ladle to pour an open sand casting, the following rules are presented (1) To find the weight of the casting and (2) The weight of iron in the ladle.

Weight of the casting is found by multiplying the cubical content in inches by 0.26. The result is the weight in pounds. Thus a plate 30 x 60 in. and 1½ in. thick will weigh 30 × 60 × 1½ × 0.26 = 702 lb. Sometimes it is more convenient to reckon the area in square ft, especially in large plates. The weight of a square ft of cast iron 1 in. thick is 37½ lb. The figures for the foregoing plate then will be 2½ × 5 × 1½ × 37.5 = 703 lb.

Weight of a circular plate is found by squaring the diameter in inches and multiplying by the constant 0.206. Result is the weight of a plate 1 in. thick. A plate 60 in. diam and 1 in. thick will weigh 60 × 60 × 0.206 = 741 lb. For a plate 2 in. thick the weight is doubled, for a plate ½-in. thick the result is halved, and so on. The rule, as previously explained, also may be applied to finding the capacity of a ladle, or for determining the quantity of metal required in a ladle to pour any given casting.

Assuming that the problem is to tap 702 lb of iron into a 20-in. diam ladle. A cast iron plate 20 in. diam and 1 in. thick weighs 82.40 lb. Obviously if 702 is divided by 82.40 the answer will be the height of the body of iron in the ladle—in this instance 8½ in. A mark is placed on the lining of the ladle 8½ in. from the bottom and the iron from the spout or the holding ladle is allowed to flow into the ladle until it reaches the mark.

Practical unanimity prevails in the opinion that danger of warpage always is present in long, thin, light castings. Although not to as great extent, the tendency also is found in long heavy castings, particularly when the casting is not uniform in section thickness. To date apparently no universal method has been developed for accurately predicting or for preventing this condition. Consensus seems to indicate that each type of casting merits individual treatment. An experienced foundryman can look at a pattern and judge fairly closely whether or not the casting will warp, and to what extent, if molded with proper care. The usual method to prevent warping is to bend the pattern in the opposite direction. The amount is based on experience. In many instances castings warp when shaken out too hot. Here the logical remedy is to leave the castings in the mold until contraction has ceased. In some cases a change in the gating system will prevent warpage.

The foregoing remarks apply particularly to castings poured in cope and drag molds. However, the same observations apply to castings poured in open sand molds. When the latter castings are left to cool without the precaution of covering them with sand, the ends will spring up, due to the fact the upper face cools first and commences to contract before the bottom face. To prevent open sand plates from warping, the usual preventive measure is to cover the ends and leave the center open. On long plates the usual practice is to cover the plate with sand and then strip a channel diagonally from corner to corner. The width may vary from 4 to 12 in. depending on the overall area of the casting.

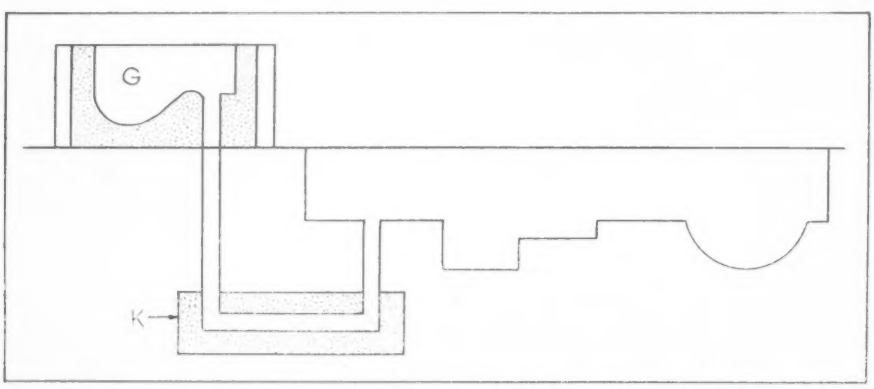

Fig. 2—Method of introducing metal to mold bottom through pouring basin G and dry sand core K. Height of G determines metal speed and pressure

Book Review

Metallurgische Verarbeitung von Altmetallen und Rueckstaenden, Band II, By Edmund R. Thews, cloth, 290 pages, 6½ x 9¼ inches, published by Carl Hanser Verlag, Munchen 27, Germany. Price 31.50 DM.

This German book on *Metallurgical Treatment of Old Metals and Wastes* is Part II on the subject. The first part dealt with white metals such as lead, zinc, etc., while this relates to copper and copper-base alloys. The book is divided into 21 chapters of which the first two discuss sorting of the metals and the general treatment procedures available. The next five chapters deal with the methods of handling copper scrap, and are followed by those on brasses, special brasses, and bronzes. Other chapters relate to gas content and porosity; deoxidation means; use of various types of melting units such as the converter, crucible, electric furnace and barrel furnace; screening of chips; stripping of lead-covered cable, etc., and closes with a chapter on the occupational diseases lead poisoning and zinc fever or shakes.

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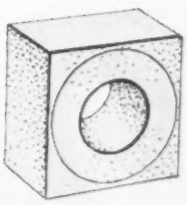

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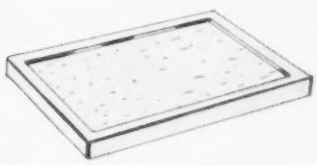

DOOR LININGS
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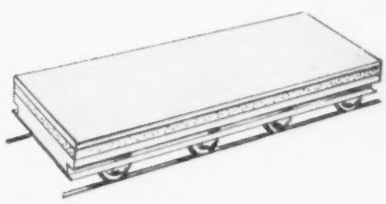

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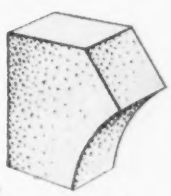

SPECIAL SHAPES
Kaocast special shapes cast over week-end to meet production demands.

The Chief Engineer of a mid-western power plant finds B&W Kaocast so *versatile* that he always keeps a ton or more on hand for miscellaneous jobs. This is only one of hundreds of plants in a list of diversified industries which are discovering practical, time-and-money-saving uses for this unique 3000 degree refractory castable. The panel at right gives a few examples.

There are good reasons for these Kaocast "success stories". This jack-of-all-refractories can be molded in a hurry *by you, when you need it.* It can be cast directly in place or applied by cement gun. Kaocast not only makes possible faster repairs and eliminates the need for a large inventory of special shapes, but it also stays on the job. That's because Kaocast has high resistance to spalling and slag attack, low volume change and negligible re-heat shrinkage.

Get all the data on easy-to-use, versatile Kaocast from your B&W Field Engineer. His specialized experience is an important B&W "extra".

KAOCAST is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST, NEW YORK 6, N.Y.
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R-407

B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment . . . Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

Constant . . . Development

Precision Details make

FANNER CHAPLETS AND CHILLS

the Finest Procurable

The All-New GROOVESTEM brings your foundry

1. Assured Core Support
2. Maximum Fusion
3. Freedom from Leakers
4. Accurate Wall Thickness

Important Notice:

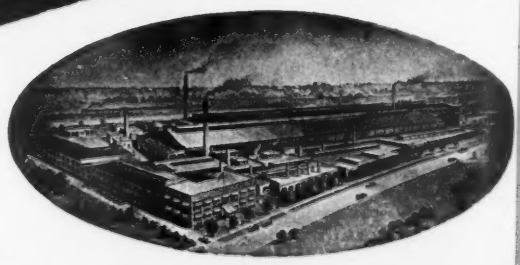
Two motion picture films—one on the use of Chaplets, the other on the use of Chills—are available, free of charge, for showing at Foreman Club meetings, in technical schools, A. F. A. chapter meetings, etc. Write for reservation.

THE FANNER MANUFACTURING CO.

BROOKSIDE PARK
CLEVELAND 9, OHIO

CANADIAN FANNER, LTD. HAMILTON, ONTARIO

Birdseye view of the Fanner Brookside Park plant in Cleveland



STANDARD SPECIFICATIONS FOR FERROMOLYBDENUM

ASTM Designation: A 132—50

Adopted, 1934; Revised, 1939, 1950.

Scope

1. These specifications cover two grades of standard ferromolybdenum designated A and B.

Basis of Purchase

2. (a) Unless otherwise specified, ferromolybdenum shall be furnished crushed to a size 1 in. or less.

(b) The reported percentage of molybdenum as obtained by chemical analysis shall be used to determine the billing of the material to the purchaser.

Chemical Composition

3. (a) The material shall conform to the requirements as to chemical composition prescribed in Table 1.

Chemical Requirements For Ferromolybdenum[a]

	Grade A	Grade B
Molybdenum, per cent[b]	55.0 to 70.0	55.0 to 70.0
Carbon, Max., per cent	2.5	0.25
Phosphorus, max., per cent	0.10	0.10
Sulfur, max., per cent	0.25	0.25
Silicon, max., per cent	1.5	1.5
Copper, max., per cent	1.0	1.0

[a] For purposes of determining conformance with these specifications, the reported analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of the Recommended practices for designating Significant Places in Specified Limiting Values (A.S.T.M. Designation: E 29).

[b] For purposes of determining the molybdenum content of any shipment, molybdenum shall be reported to the nearest 0.01 per cent, applying the same rounding-off procedure as prescribed in Footnote a.

(b) The manufacturer shall furnish an analysis of each shipment showing the molybdenum content and, when required, such of the other elements specified in Paragraph (a).

Packing

4. Ferromolybdenum shall be packed in sound containers in such manner that none of the metal is lost in shipment.

Inspection

5. (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the sampling, packing, and shipping of material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications.

(b) If the purchaser so elects, the material may be sampled by him at the destination, in which case at least 10 per cent of the containers shall be sampled.

Rejection

6. Any claims or rejections based on check analysis shall be made to the manufacturer within 30 days from receipt of material by the purchaser.

Sampling

7. The material shall be sampled in accordance with the Standard Methods of Sampling Ferro-Alloys (A.S.T.M. Designation: E 32).

Chemical Analysis

8. The chemical analysis of the material shall be made in accordance with the procedure for ferromolybdenum as described in the Standard Methods of Chemical Analysis of Ferro-Alloys (A.S.T.M. Designation: E 31).

STANDARD SPECIFICATIONS FOR FERROTUNGSTEN

ASTM Designation: A 144—50

Adopted, 1934; Revised, 1939, 1950.

Scope

1. These specifications cover the standard grade of ferrotungsten only.

Basis of Purchase

2. (a) Unless otherwise specified, ferrotungsten shall be furnished crushed to a size 1 in. and less.

(b) The reported percentage of tungsten as obtained from chemical analysis shall be used to determine the billing of the material to the purchaser.

Chemical Composition

3. (a) The material shall conform to the requirements as to chemical composition prescribed in Table 1.

Chemical Requirements For Ferrotungsten[a]

Tungsten, per cent[b]	70.0 to 80.0 as specified
Carbon, max., per cent	0.60
Manganese, max., per cent	0.75
Phosphorus, max., per cent	0.06
Sulfur, max., per cent	0.06
Silicon, max., per cent	1.0
Copper, max., per cent	0.10
Arsenic, max., per cent	0.10
Antimony, max., per cent	0.08
Tin, max., per cent	0.10
Sum of Arsenic, antimony, and tin, max., per cent	0.20

[a] For purposes of determining conformance with these specifications, the reported analysis shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of the Recommended Practices for Designating Significant Places in Specified Limiting Values (A.S.T.M. Designation: E 29).

[b] For purposes of determining the tungsten content of any shipment, tungsten shall be reported to the nearest 0.01 per cent, applying the same rounding-off procedure as prescribed in Footnote a.

(b) The manufacturer shall furnish an analysis of each shipment showing the tungsten content and, when required, such of the other elements specified in Table 1.

Packing

4. Ferrotungsten shall be packed in sound containers in such manner that none of the metal is lost in shipment.

Inspection

5. (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the sampling, packing, and shipping of material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications.

(b) If the purchaser so elects, the material may be sampled by him at the destination, in which case at least 10 per cent of the containers shall be sampled.

Rejection

6. Any claims or rejections based on check analysis shall be made to the manufacturer within 30 days from receipt of material by the purchaser.

Sampling

7. The material shall be sampled in accordance with the Standard Methods of Sampling Ferro-Alloys (A.S.T.M. Designation: E 32).

Chemical Analysis

8. The chemical analysis of the material shall be made in accordance with the procedure for ferrotungsten as described in the Standard Methods of Chemical Analysis of Ferro-Alloys (A.S.T.M. Designation: E 31).

6 Good Reasons

WHY YOU SHOULD BUY YOUNGSTOWN CONTAINERS

for Intra and Inter-plant handling of bulk materials and for L.C.L. shipments in freight cars and ships

1. EASE OF OPERATION

The single, hinged door of Youngstown Containers is positively and securely locked when closed. Easy release of the door and quick and complete discharge of the load are obtained by a gentle pull of the release cable. The discharge door is automatically locked when it swings closed and inspection for locking before loading the container is unnecessary. This saves you time and money.

2. VERSATILITY

Youngstown Containers can be handled by lift truck or single drum hoists. Double drum hoists are not required. These containers can handle castings with the same facility as sand, sea coal, bentonite and coarser materials.

3. SAVINGS IN HANDLING COSTS

Youngstown Containers can be moved directly to the points where material will be used and unloaded on the spot. No intermediate handling is necessary and no dumping into storage bins for later use is required. Thus handling costs are substantially reduced.

4. ADAPTABILITY

Youngstown Containers are carefully engineered. Their design is sufficiently flexible so that they can be adapted to your requirements.

5. CAPACITY AND WEIGHT

Youngstown Containers give you the largest capacity to weight ratio of any container of this type.

6. STRENGTH AND WEIGHT

Youngstown Containers possess the greatest strength per unit of weight of any container of this type. Long life and overall economy is thus assured.

THE YOUNGSTOWN STEEL DOOR CO.

Camel Sales Company · Camel Company Limited

CLEVELAND • CHICAGO • NEW YORK • YOUNGSTOWN

Impregnating Castings

FOR PRESSURE TIGHTNESS

MANY castings designed to be pressure tight, may not meet tests which usually are conducted at pressures at least 50 per cent higher than those to which the casting will be subjected in service. While physical properties of most alloy castings are unaffected adversely by the amount of porosity usually encountered, their use in applications requiring pressure tightness is affected. To avoid unnecessarily high scrap in such castings, impregnating processes for sealing porosity have been developed to make the castings usable.

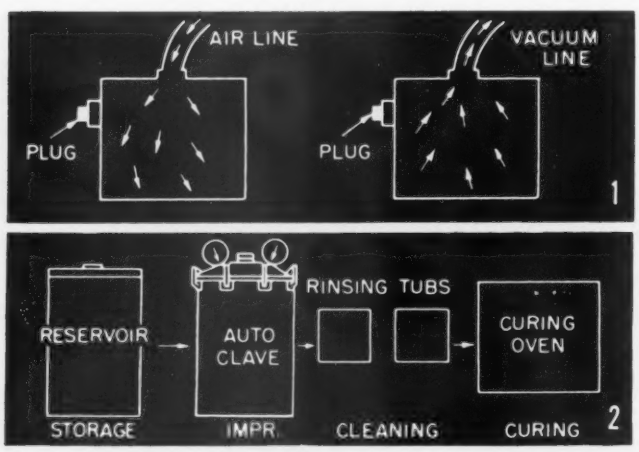
In the past a number of impregnants, including sodium silicate (water glass), tung oil, and phenolic and styrene thermosetting resins, have been used. Progressively exacting requirements of industry have stimulated search for improved sealants. Development of such a sealant is claimed by Western Sealant Inc., Culver City, Calif. Named P.E. No. 1, it is a thermosetting copolymer, containing 100 per cent solids, said to be capable of withstanding extreme pressures and temperatures and of avoiding reaction with industrial liquids and gases. Its application to ferrous and nonferrous castings is said to be quick, economical and permanent. Treated parts show no discoloration, change in critical tolerances, or other indication of impregnation.

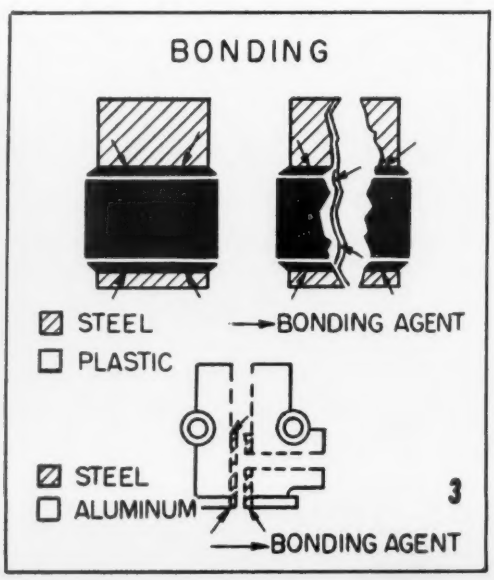
To assure good penetration, the sealant is applied to the metal through the use of compressed air or vacuum, or both. For treating castings individually (Fig. 1) the part is cleaned and all except one opening closed. Sealant is poured into the single opening and air pressure line attached. Pressure is applied until the solution oozes through the casting walls. When the vacuum method is used, a hose is attached to the single opening and a vacuum drawn. The sealant is applied to the entire casting exterior or to just a local porous area.

More frequently, however, castings are treated in batch lots. A few to hundreds of castings are placed in a dry autoclave from which the air is exhausted until a vacuum of 28 in. of mercury is reached. The vacuum is maintained while enough sealant is introduced to cover the castings. Then the vacuum is released and air at 100 psi is applied for at least 30 minutes. At the end of this time air pressure is reduced to 15 psi and the sealant is removed to a storage reservoir. The parts are drained, rinsed in solvents, dried, and cured in an oven for 10 minutes at 300°F. Fig. 2 diagrammatically illustrates these operational steps.

An outgrowth of the batch impregnating process is a method of bonding similar or dissimilar materials such as plastics, neoprene, glass, and ferrous and nonferrous metals in such forms as sleeves and inserts (Fig. 3). Parts are assembled manually or hydraulically, depending upon tolerances involved, put through the regular impregnating cycle, and cured. The sealant penetrates the space between contacting surfaces and forms a tough, resilient wedge. Because the bonding agent is anhydrous and a good insulator, it also will prevent electrolysis at the contact surfaces when dissimilar metals are bonded together.

Top section of Fig. 3 shows a phenolic plastic protector ring bonded to a roughened steel pipe where a minimum of 6500 lb in shear is required. At bottom a steel sleeve is shown bonded to 356-T6 aluminum; both bonding surfaces were smooth. This assembly was pressure tested at 2250 psi.



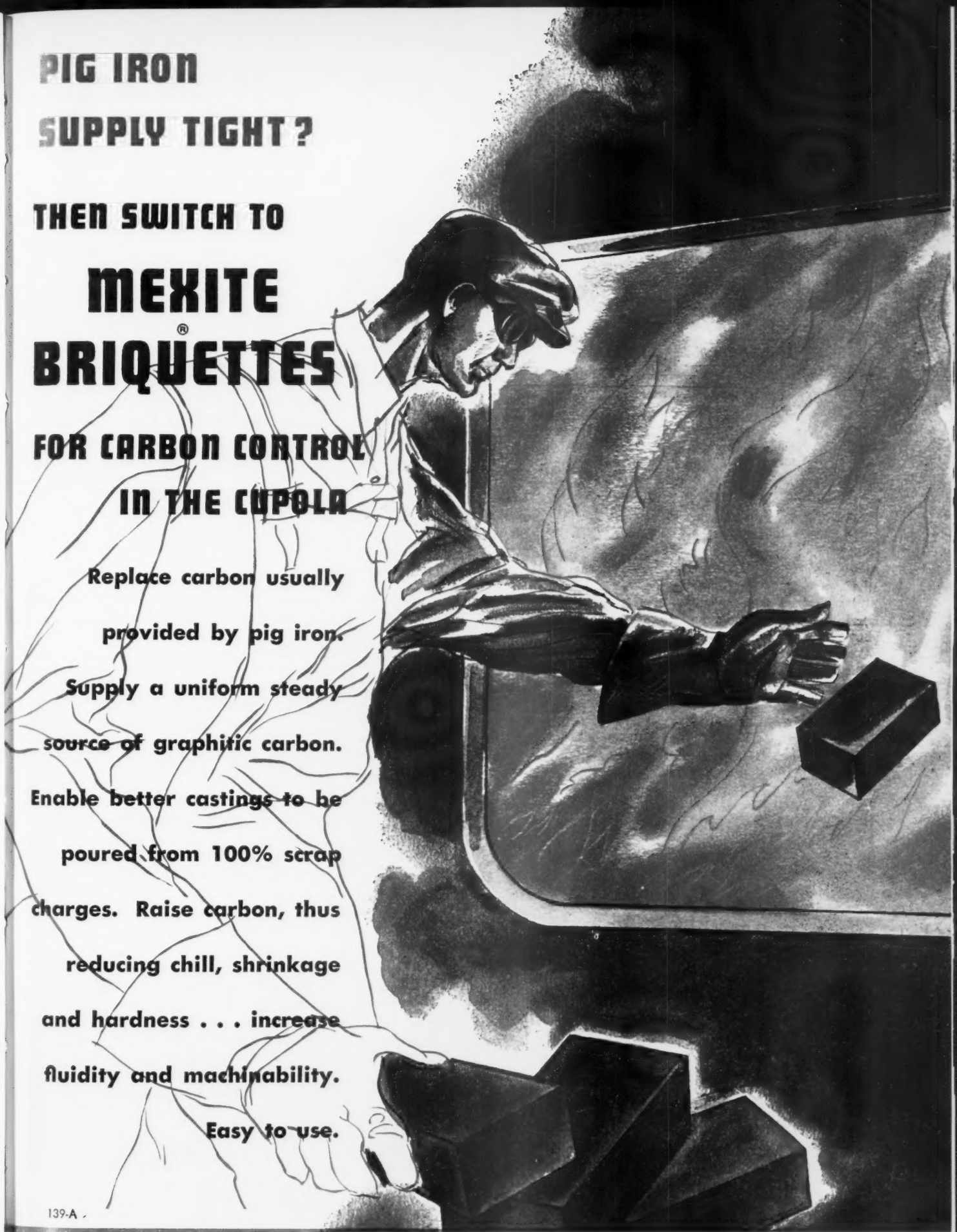


PIG IRON SUPPLY TIGHT?

THEN SWITCH TO

MEXITE® BRIQUETTES

FOR CARBON CONTROL IN THE CUPOLA



Replace carbon usually provided by pig iron. Supply a uniform steady source of graphitic carbon. Enable better castings to be poured from 100% scrap charges. Raise carbon, thus reducing chill, shrinkage and hardness . . . increase fluidity and machinability. Easy to use.

139-A

THE UNITED STATES GRAPHITE COMPANY

Division of The Wickes Corporation • Saginaw, Michigan

Activities of Foundry

GROUPS

Chesapeake

SUBJECT of the November meeting of Chesapeake Chapter of the AFS was "The Trainee, the Journeyman and the Engineer in the Foundry Industry," which was discussed by Fred G. Sefing, International Nickel Co., New York, and a national director of AFS.

Mr. Sefing pointed out that we have new labor-saving equipment that reduces costs in foundry operation; but it is the loyalty of our workers that is worth more than all the machines we can buy. A company without a program for training supervisory personnel is gambling with the future. If future supervisors cannot be spotted among the employees, the company is headed for rough water. He pointed out that high schools, trade schools and colleges provide a well of young men for all classes of help. Responsibility for getting the ball rolling rests with top management. More interest is shown by the student when he is contacted directly by the company itself.

After the potential supervisor has been hired, assign a supervisor to him as a confidant, and encourage him to tell all his ideas, good or bad. Mr. Sefing closed by telling the group of the success of the effort being made in the college field by the Foundry Educational Foundation. He stated that the industry's investment there is paying off.—*Joseph O. Danko, Arlington Bronze & Aluminum Corp.*

Southern California

MORE than 380 members and guests of Southern California Chapter of the AFS enjoyed the annual Christmas stag held Dec. 8 at Lakewood Country Club. After dinner, a drawing was held for door prizes, followed by a 2½-hour program of professional entertainment. The chapter is indebted to the entertainment committee which included: Bill Baud, Mechanical Foundries Division, Food Machinery Corp., chairman; Stan Brand, Snyder Foundry Supply; Paul Clapp, Warren Foundry; Robert Ditmore, Federated Metals Division, American Smelting & Refining Co.; Ray Dorcey, Westlectric Castings Inc.; John Hyatt, Grant & Co.; Art Lamb, Independent Foundry Supply; James Oliva, Oliva Supply Co.; Ray Orr, Howell Foundry; Warner Stenberg, United States Motors; Tony Tuzzolino, Overton Foundry; and Ed Worth, Mechanical Foundries Division, Food Machinery Corp. —*Alfred A. Grant III, Grant & Co.*

Northwestern Pennsylvania

MORE than 300 members and guests were present at the Nov. 26 meeting of Northwestern Pennsylvania Chapter of the AFS to hear Dan Farrell, supervisor of safety for U. S. Steel Co. His talk was entitled "The Three C-s of Saftey," and offered practical suggestions.

Mr. Farrell stressed the fact that accidents do not just happen; they are caused. To prevent accidents, the causes must be removed. He then presented a number of charts on which accidents were plotted and analyzed to determine these causes and by this method his company has been able to reduce the number of accidents.

A dramatic skit, "Let's Pretend,"

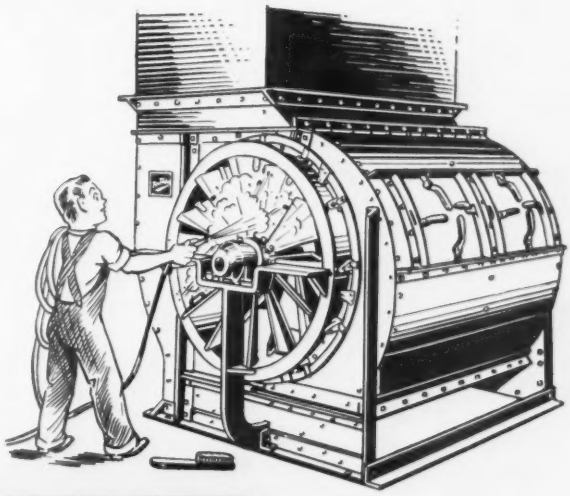
(*Continued on page* 177)

MICHIGAN STATE Student Chapter of the AFS heard Vaughan C. Reid Jr., vice president, City Pattern Foundry & Machine Co., Detroit, discuss and demonstrate the shell molding process at its meeting Nov. 17. The demonstration was made in the college foundry laboratory with the help of William Ochenski, foundry foreman, City Pattern Foundry & Machine Co., and members of the student chapter. At left above, left to right, are: Mr. Ochenski; Wesley Haushildt, student chapter chairman; Ernest Frens, foundry student; Mr. Reid, and in front of Mr. Reid, Herbert Schlachter, student chapter secretary-treasurer. At right, Mr. Schlachter is skimming the ladle while Mr. Hauschildt pours a shell mold

"Buffalo" *Tips on Getting the Best Service from your Fans*

Regular Cleaning *Prevents* Dirt *From* Unbalancing Fan Rotors

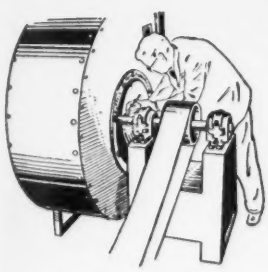
When a little dirt collects on a fan blade, more dust, dirt and grease will lodge there. Eventually, this can unbalance the entire rotor, gradually affecting fan performance and causing vibration which could burn out bearings, spring shaft and loosen the foundation. Periodic cleaning by wire brush, scraper or compressed air as shown at right can head off these troubles. "Buffalo" rotors are balanced at our factory by modern precision equipment, and if kept clean, should remain so indefinitely to give you vibrationless performance.



Far left, balancing fan wheels at the Buffalo factory

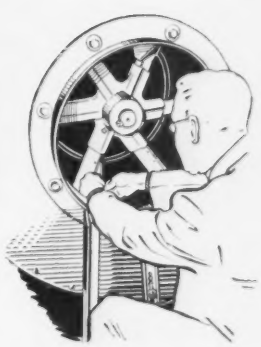
Left, a Buffalo Double Width induced Draft Fan

HAND-BALANCING A ROTOR BY CHALKING SHAFT



Clean shaft, run fan up to speed. Hold point of sharpened chalk stick so that it just touches shaft. This will scribe a line on the shaft—the shorter the line, the greater the unbalance. Have U-shaped weights ready for trial balancing.

Place a trial weight on heel of blade 180 deg. away from chalk mark. Repeat test runs with varying weights until a line is made all around the shaft; then the wheel is in balance. A complete instruction booklet is yours on request, describing the procedure in detail.



"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

221 MORTIMER ST. BUFFALO, N. Y.

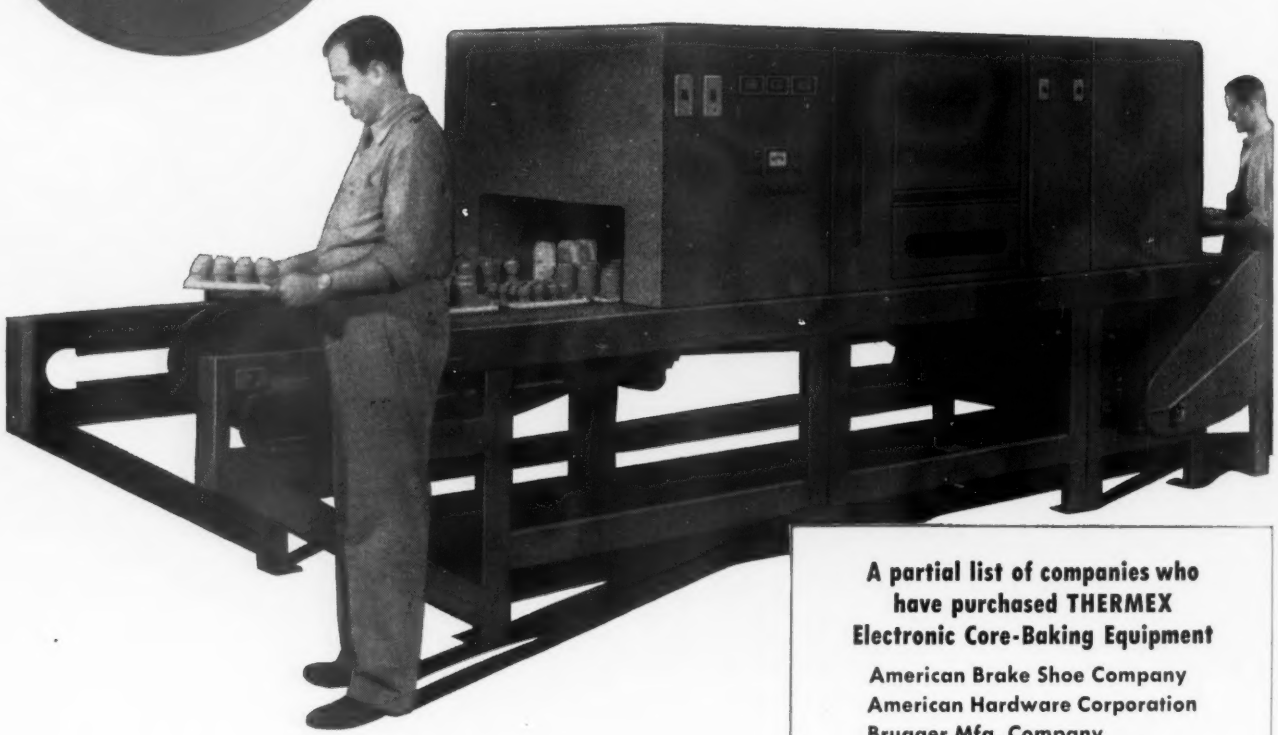
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING FORCED DRAFT · AIR WASHING COOLING · AIR TEMPERING HEATING · INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

Thermex

ELECTRONIC CORE-BAKING EQUIPMENT

"Pays for itself in less than a year"



A partial list of companies who have purchased THERMEX Electronic Core-Baking Equipment

- American Brake Shoe Company
- American Hardware Corporation
- Brugger Mfg. Company
- James B. Clow & Sons
- Crane Company
- Drake Non-Clinking Furnace Block Co., Inc.
- Ford Motor Company
- Fundicao Tupy
- Grand Haven Brass Foundry
- Grinnell Corporation
- International Harvester Co., Ltd.
- Moline Malleable Iron Company
- Mueller Company
- National Malleable & Steel Castings Company
- Ontario Malleable Iron Co., Ltd.
- Phoenix Brass Fittings Corp.
- Ronci Co., Inc.
- Sterling-Faucet Company
- U. S. Pipe & Foundry Company
- Walworth Company

FOUNDRIES are making spectacular savings with THERMEX Core-baking Equipment—often report that this labor-saving equipment pays for itself in less than a year.

For instance, one company* which replaced conventional drying ovens with two THERMEX Core-baking Units is making a saving of 27.8% for each 1,000 pounds of finished cores. Based on the foundry's total production, *savings amount to $28,970* per year.

Why not take advantage now of this cost- cutting equipment? A THERMEX field engineer will be glad to show you engineering economy studies, based on verified installations like this, which give complete cost data. Write The Girdler Corporation, Thermex Division, Louisville 1, Ky.

See how Thermex can cut your costs!

Name on request

THERMEX-T. M. Reg. U. S. Pat. Off.

the GIRDLER Corporation

THERMEX DIVISION

(*Continued from page* 174)
in which safety is stressed then followed and all present took part.

Fred Carlson, Weil-McLain Co., Erie, introduced the speaker and J. Douglas James, Cooper-Bessemer Corp., Grove City, Pa., and chairman of the chapter, presided.

The chapter's annual Christmas party was held at the Siebenbuerger Singing Society, Dec. 14. The 300 members and guests attending enjoyed a dinner and floor show in addition to participating in prize drawings.

In charge of arrangements was a committee headed by R. C. Strong and including Jake Diemert, Fred Smith, Bailey Herrington, Ed Sierk, Robert Humphreys, Fred Carlson and Dewey Davis.—*Roy A. Loder, Erie Malleable Iron Co.*

Western New York

MEMBERS of Western New York Chapter of the AFS found most interesting the history of core additives which J. A. Gitzen, president of Delta Oil Products Co., Milwaukee, presented as part of his talk at the chapter's December meeting. He also included in his discussion a history of molding practices and the effects of excess moisture in the sand as well as the uses of facing materials. In conclusion, Mr. Gitzen instructed the members on the proper way of testing cores. He was emphatic in his opinion that most foundrymen use an excess of sand additives. J. R. Wark, president, Wark Foundry Services Inc., was technical chairman.

The meeting also included the presentation of the film, "Thruway of Tomorrow" produced by the New York State Department of Public Works.—*Marve Taublieb, Frederic B. Stevens Inc.*

Michiana

SPEAKING before one of the largest groups to attend a meeting this year, Warner B. Bishop, manager of the Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, discussed "Control of Core Production," at the December dinner of Michiana Chapter of the AFS. After a chicken dinner at the Indiana Club, South Bend, Ind., the film, "The ADM of Cores," was presented and the meeting opened for a discussion of core practice.

Chapter Chairman Stanley F. Krzeszewski announced that a cash prize of $50 would be given the member who signed up the most new members during the year.—*A. J. Rumely Jr., LaPorte Foundry Co.*

WESTERN NEW YORK Chapter of the AFS met Dec. 7 to hear J. A. Gitzen, Delta Oil Products Co., Milwaukee, speak on "Sand Additives." At the speakers' table, left to right, are: George Boryszewski; John Wark; Mr. Gitzen; Carl A. Harmon; Erwin Deutschlander, chapter chairman; John H. Graf, New York State Truway Commission; A. J. Heysel; Martin J. O'Brien Jr., and Lynford Roberts. Photo courtesy of Marve Taublieb, Frederic B. Stevens Inc.

Chicago

SAFETY was the theme for the Dec. 3 meeting of the Chicago Chapter, AFS, at the Chicago Bar Association, with D. A. Farrell, supervisor of safety, United States Steel Corp., Pittsburgh, as the principal speaker. The meeting also permeated with a National Officers Night tone with the guest appearance of I. R. Wagner, national vice president, and retired president, Electric Steel Castings Co., Indianapolis, and William W. Maloney, national secretary.

Chapter President Walter W. Moore, works manager, Burnside Steel Foundry Co., presided over the general portion of the meeting attended by some 135 members and guests. He announced that the chapter's educational activities during the coming year will center in a "School of Melting" to be presented in February and March. The school will be divided into steel, gray iron, malleable and nonferrous sections, with sessions scheduled in staggered fashion so that those interested in two or more divisions will find no conflict in dates.

Introduced by President Moore, Mr. Wagner greeted the chapter on behalf of the national officers and then concentrated on activities of the society's new "Safety, Hygiene and Air Polution" division headed by Kenneth M. Moore as staff director. He outlined the 10-year program which has been started and asked the cooperation of the foundry industry to assure its success. The program involves the raising of $350,000 during the 10 year period to conduct the proposed activities.

Mr. Maloney also was introduced and devoted his time to outlining plans for the International Foundry Congress in Atlantic City next May. He stated that 80 per cent of the space available in the show to be conducted concurrently with the congress is under application.

Introduction of Mr. Farrell was made by Chapter Vice President John H. Owen, Chicago district sales manager, Harbison-Walker Refractories Co. Subject of Mr. Farrell's address was "Three C's of Safety." In the presentation, it developed that the three C's stand for "Comprehension" of the safety problem, "Contact" with machinery and material which pro-

TWIN CITY Chapter of the AFS held its Christmas party Dec. 10 at Nicollet Hotel, Minneapolis, with more than 400 guests present. Photos by courtesy of O. Jay Myers, Archer-Daniels-Midland Co.

vides safety hazards, and "Control" of the factors which will provide safety.

Three roundtable sessions provided the program for the Jan. 7 meeting of the Chicago Chapter. Attendance of 225 hit the top for the current season. A preliminary feature was a short sound movie on "General Safety in the Shop" through courtesy of Burnside Steel Foundry Co.

In presiding at the general portion of the meeting, Chapter President Moore, announced that the chapter's Ladies' Night dinner will be held at the Palmer House, Feb. 23.

The gray iron and malleable divisions joined forces in a roundtable on "Foundry Core Practice." Robert P. Schauss, Chicago manager, Werner G. Smith Inc., was the speaker, and Cecil F. Semrau, metallurgist, Illinois Malleable Iron Co., presided.

"Core Blowing" was the subject considered at the steel division session at which Harry Hunt, general superintendent, Pettibone Mulliken Corp., was chairman. Speakers were Victor M. Rowell, service engineer, Foundry Productions Division, Archer-Daniels-Midland Co.; and L. D. Pridmore, vice president, International Molding Machine Co.

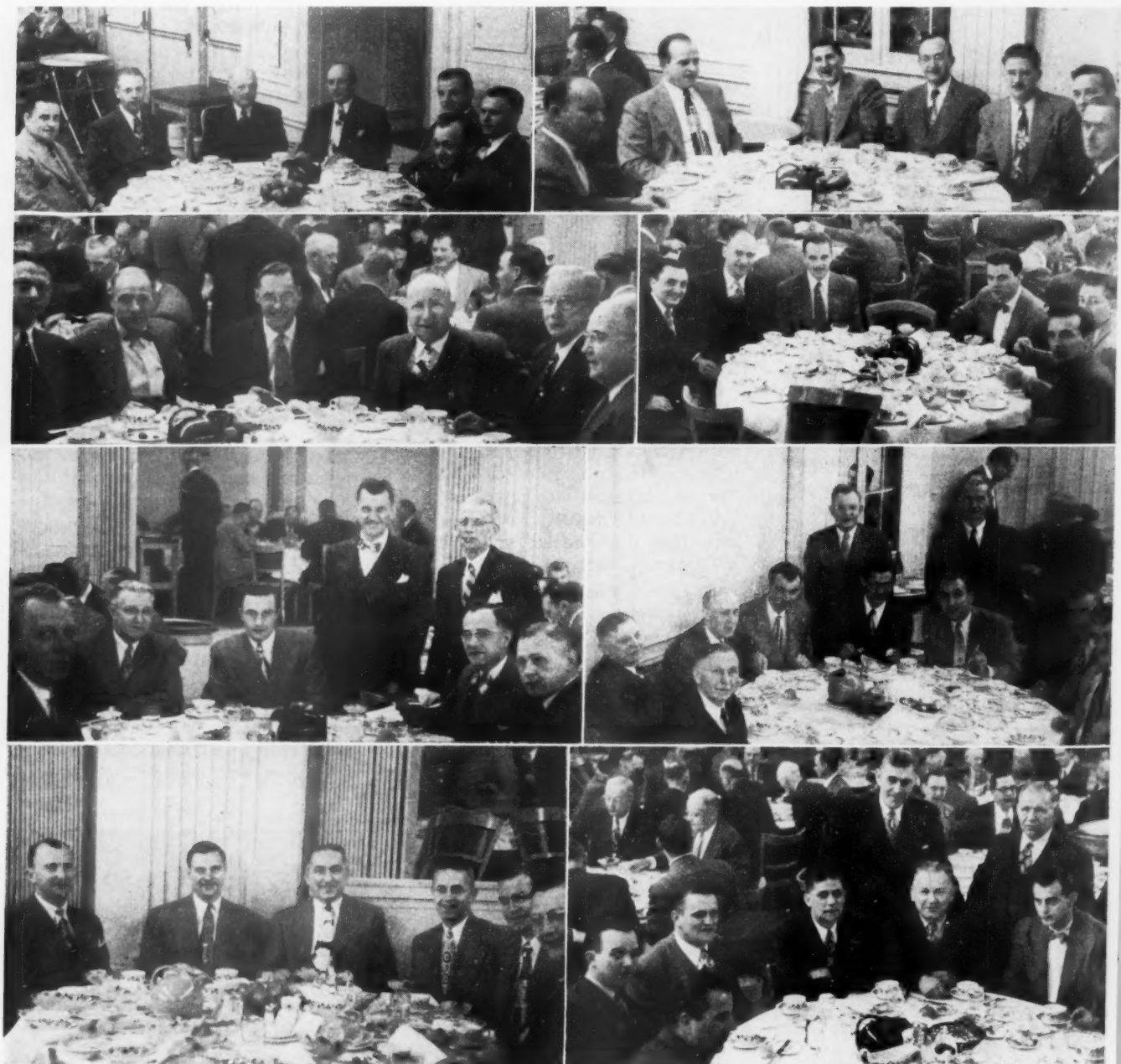
Richard Olson, owner, Englewood Pattern Co., spoke on "Nonferrous Patterns" before the nonferrous division roundtable. William L. Rudin, foundry metallurgist, Elesco Smelting Co., presided at the nonferrous session.

Next chapter meeting on Feb. 4 will feature as speakers William T. Bean Jr., research consultant, Detroit, on "Good Casting Design on Purpose," and Ralph L. Lee, General Motors Corp., Detroit, on "People as They Come and Are."—*Erle F. Ross*

Northeastern Ohio

ATTENDANCE at the annual Christmas party held on Dec. 13 by Northeastern Ohio Chapter of the AFS, was up to the 1000-capacity of the Rainbow room, Hotel Carter, Cleveland. Passing up the traditional turkey, the members and guests en-

(*Continued on page* 180)



NORTHEASTERN OHIO Chapter of the AFS held its annual Christmas party Dec. 13 at Hotel Carter, Cleveland. Views of some of the 1000 guests are shown above. Photos by courtesy of Sterling N. Farmer, Sand Products Corp.

Always HIGHER CASTING *Production...*

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Illustration shows mold half from an "ACCURATE" drag pattern in production at Federal Malleable Company, Milwaukee, Wisconsin.

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NORMAL, ILL.
Clarence C. Schmidlin
Telephone: Normal 8551-5

LOS ANGELES, CALIF.
McGowan Company, Inc.
Telephone: Trinity 2057

(*Continued from page* 178)
joyed a roast beef dinner, and then sat back to take in a 2-hour floor show arranged under the direction of L. P. Robinson, chairman of the chapter's entertainment committee.—*Edwin Bremer.*

Eastern Canada

A LARGE number of members and guests attended the Dec. 14 meeting, held at Mount Royal Hotel, Montreal, Que., by Eastern Canada Chapter of the AFS to hear Albert F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, discuss "Co-Ordination Function of Pattern Equipment and Castings."

Mr. Pfeiffer brought with him an interesting group of exhibits as well as slides to illustrate his remarks. Many of the exhibits exemplified his recommendation to produce wooden models of complicated castings for study by the foundry and pattern shop before designing pattern and corebox equipment. The relatively small cost of producing these models is well worthwhile since they permit foundryman and patternmaker to visualize accurately molding, coring and gating problems. In cases where several foundries will produce castings

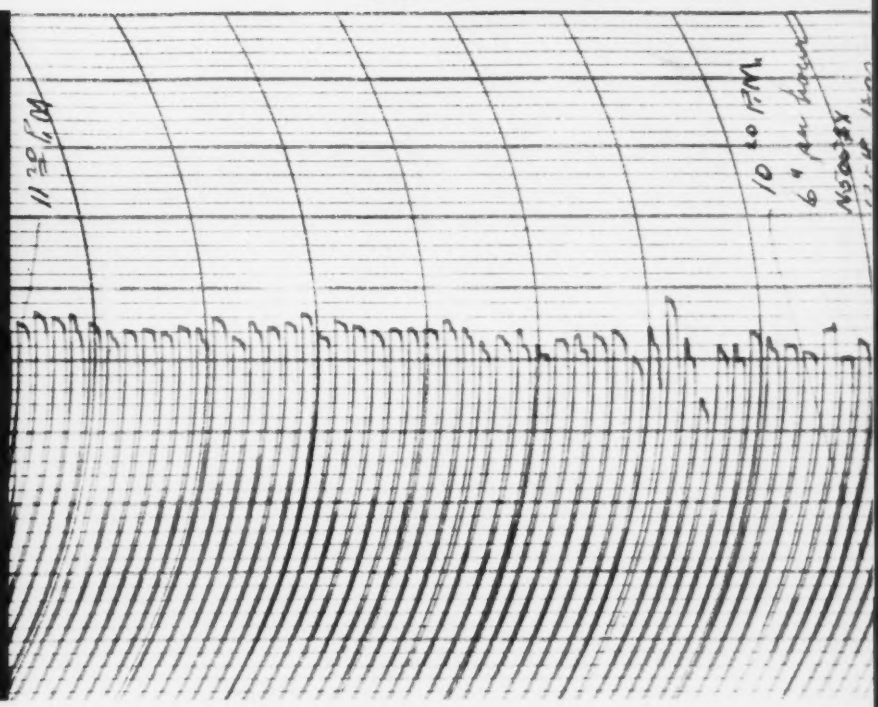
(*Continued on page* 185)

CENTRAL OHIO Chapter of the AFS held its Christmas party Dec. 8 at Brookside Country Club. Photo courtesy of Wilfred H. White, Jackson Iron & Steel Co.

METROPOLITAN Chapter of the AFS held its Christmas party Dec. 7 at the Essex House, Newark, N. J. Views of some of the guests are shown above. Photos by John Bing, Metropolitan Refractories Corp.

An actual record of one hour's operation of a typical manually controlled Model "80" Speedmullor. Fifty 1-ton batches of synthetic molding sand were loaded, mulled to maximum physical properties, and discharged in this period.

Batch after Batch...



... A CONTINUOUS SUPPLY OF COMPLETELY MULLED SAND ...

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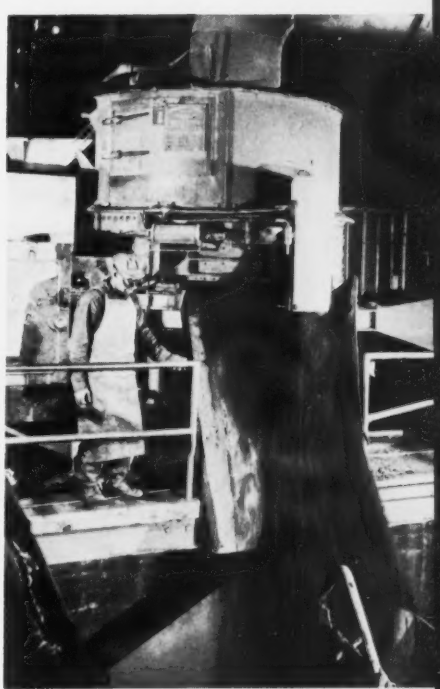

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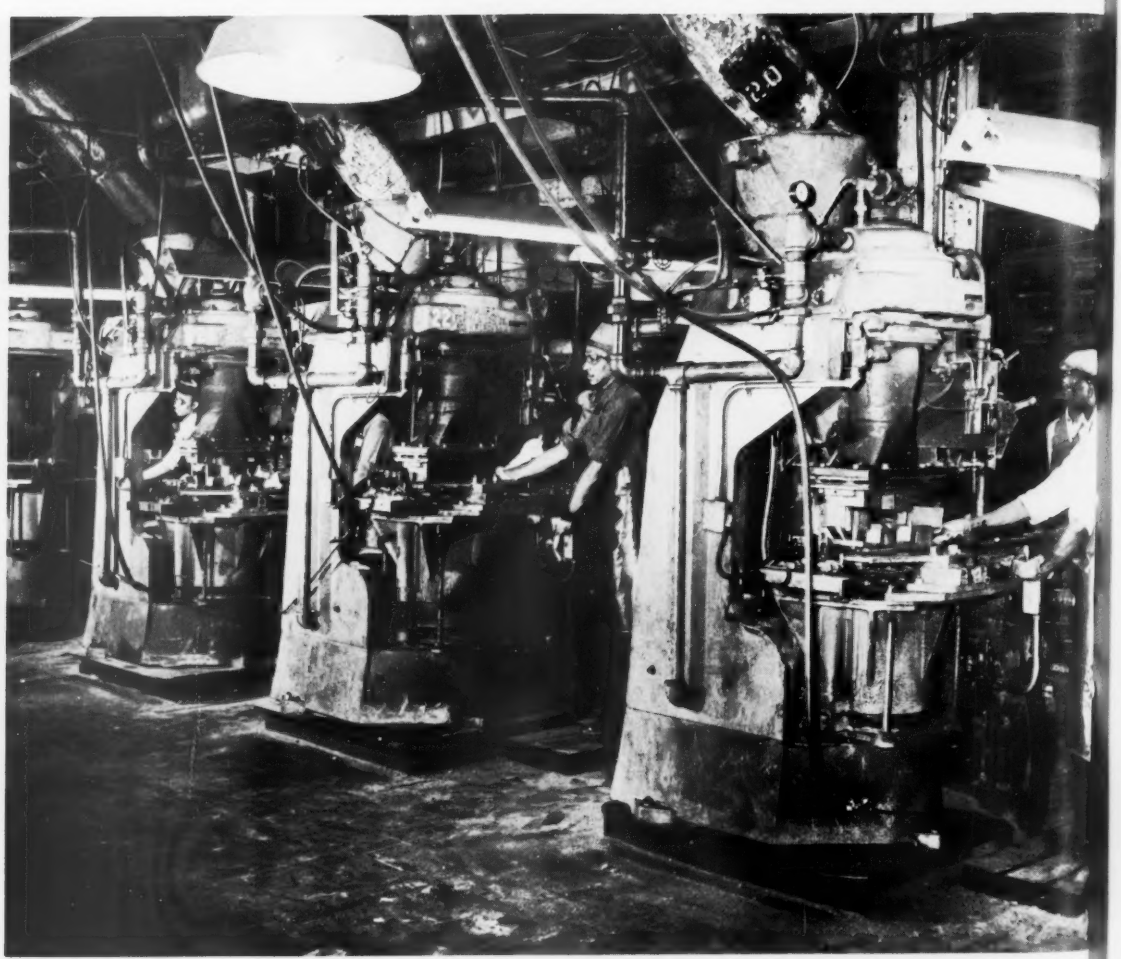
LOOK TO BEARDSLEY & PIPER FOR BETTER METHODS

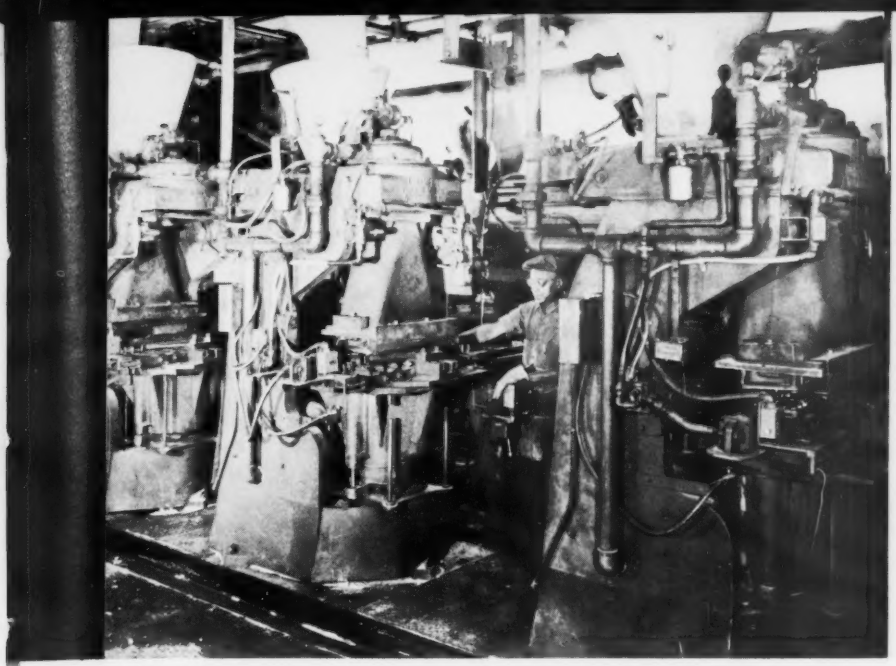
Need More Core Production?

Ford got it with CHAMPION CORE BLOWERS!



Four of a battery of seven Champion **Blo-Matic** CB-15 Core Blowers making intake manifold cores at the Rouge plant. With Champions production per machine has been greatly increased on these manifold cores.

IT'S EASY AS **A-B-C . . . Automatically Blown Cores!**



Three of a battery of six Champion **Blo-Matic** CB-15 Core Blowers making cylinder head cores at Ford Motor Company. The efficiency of these Champions is far higher than that of the core blowing machines formerly used on this job.

52 BLO-MATIC* CORE BLOWERS

ALREADY IN OPERATION AT FORD MOTOR COMPANY!

Fifty-two *Blo-Matic* equipped Champion Core Blowers are already in operation at the big Rouge plant of the Ford Motor Company and forty-five more are slated for quick delivery. The Blo-Matic Champions have increased production over the former core blowing machines by a very substantial margin.

Blo-Matic times every operation in the core blowing sequence perfectly. The operator need only press a button to start the sequence. After that, clamping, blowing, drawing, and sand magazine refill operations take place quickly and automatically. The operator is free to handle a finished core and set up the next core box. *Blo-Matic* is positive, foolproof and above all, safe; it is designed and built to further improve the economy of operation that has long been a Champion feature.

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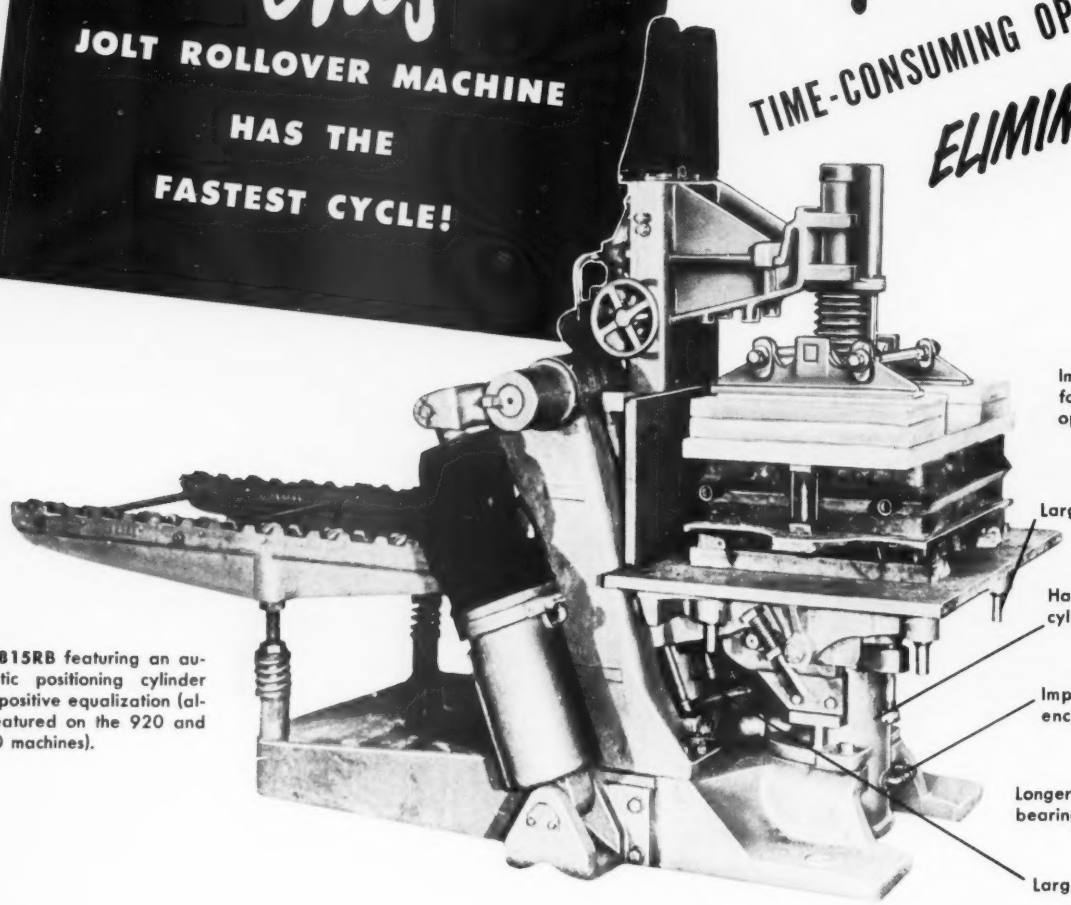
this JOLT ROLLOVER MACHINE HAS THE FASTEST CYCLE!

TWO TIME-CONSUMING OPERATIONS ELIMINATED!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The **815RB** featuring an automatic positioning cylinder and positive equalization (also featured on the 920 and 1020 machines).

Why the fastest cycle? Because in the Johnston & Jennings rollover cycle, two time-consuming operations have been eliminated. After rollover, it is unnecessary to raise a separate draw cylinder and equalize. Also eliminated is the unclamping operation necessary in the standard rollover cycle. Clamping and equalizing operations are combined in the downward stroke of a single double-action clamp and draw cylinder. Then, after rollover, this same cylinder draws the mold on its reverse stroke. No transfer of the mold load—no clamping and unclamping necessary. No pits are required for the installation of these machines. Today's rapidly changing production picture may necessitate changes in your foundry layout at any time . . . and a pit can't be moved. Use a Johnston & Jennings jolt-rollover-draw for your toughest production molding job, or use it as a rollover-draw machine in conjunction with a Sandslinger or Speedslinger. It pays to investigate . . . write today for complete information.

Johnston & Jennings
Jolt Rollover Pattern-Draw Machines

Model	Table Size	Pattern Draw	Capacity
612	24″x30″	12″	600#
815	30″x40″	15″	1200#
920	44″x54″	20″	2000#
1020	50″x60″	20″	3000#

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MOLDING MACHINE DIVISION
THE JOHNSTON & JENNINGS COMPANY
Division of Pettibone Mulliken Corp.
2424 North Cicero Ave., Chicago 39, Illinois

(*Continued from page* 180)

from the same pattern equipment, Mr. Pfeiffer recommended calling in representatives of the foundries concerned and giving consideration to their facilities before designing pattern equipment.

In discussing the use of skeleton patterns, Mr. Pfeiffer stressed the desirability of building strength and rigidity into them to save time and labor and insure production of castings to accurate dimension. A novel scheme was described for obtaining double quantity production from certain types of matchplate patterns by using slab cores across the joint of the mold and reflected patterns in cope and drag, as was also the production of coreboxes and driers by the shell molding process.—*A. E. Cartwright, Crane Ltd.*

Detroit

AT the Nov. 15 meeting of Detroit Chapter of the AFS, Archer-Daniels-Midland Co., Foundry Products Division, presented its color film, "The ADM of Cores." Warner B. Bishop, manager of the division, was commentator. Because certain practices in coreroom operations, sand mixing, moisture content, etc., as described in the film were controversial, the meeting was opened for questions from the floor. Serving as moderator in the question-and-answer period was Michael Warchol, Atlas Foundry Co., and the chapter's vice chairman. —*Howard C. Tuttle*

Pittsburgh

MORE than 1100 district foundrymen and their guests were present at the William Penn Hotel, Pittsburgh, to enjoy the annual Christmas party of the Pittsburgh Foundrymen's Association Dec. 17. The dinner, which featured roast turkey, was followed by a floor show. The committee which arranged this successful Yuletide celebration included: A. M. Cadman Jr., chairman; N. P. Kelly, W. C. Hillman, William A. Smith Jr., and Charles D. Viel.—*Dan Reebel*

Connecticut Non-Ferrous

AT the Nov. 21 meeting of the Connecticut Non-Ferrous Foundrymen's Association Richard Herold, manager of the Plastics Division of Borden Co., discussed the ureaformaldehyde core binders, the plastic binder generally used in nonferrous foundries.

The speaker emphasized that these binders, being adhesive, must be used with a liquid parting to eliminate sticking in the corebox. It was

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pointed out that plastic binders have been used in the foundry industry for about 13 years but are now reaching wider acceptance. They can be used with mullers and with blowing machines.

The opinion was expressed by some of the members present that burnt core sand has a deleterious effect on the system sand. Mr. Herold pointed out that if the dumped sand is mulled with proper binder added, no trouble will be experienced.—*J. J. Shannon*

Central Ohio

ANNUAL Christmas party and dance of Central Ohio Chapter of the AFS was held Dec. 8 at the Brookside Country Club, Columbus, O. W. T. Bland, Commercial Steel Castings Co., Marion, O., was in charge of arrangements for the meeting. A fine dinner was served to more than 50 couples, and the flower arrangements on the tables were given to the ladies whose numbers were drawn. After dinner the group enjoyed an evening of dancing.—*Wilfred H. White, Jackson Iron & Steel Co.*

Tri-State

FIRST Christmas party of what undoubtedly will prove to be an annual event was enjoyed by sixty members of the Tri-State Chapter of AFS and their ladies. A cocktail hour was followed by dinner which featured the traditional Christmas foods, and a drawing at which a number of beautiful prizes were distributed. Dancing and several tables of canasta concluded the evening.—*J. G. Winget, Reda Pump Co.*

Pine State

ANNUAL Christmas meeting of the Pine State Foundrymen's Association was held in Portland, Me., Dec. 13. Chief interest was in a talk by Clyde Sanders, American Colloid Co., Chicago, in which he commented on the effects of mold materials on the apparent shrinkage of castings. In addition, the group enjoyed a fine dinner and a floor show.—*Walter A. Sokolosky, Saco-Lowell Shops*

Metropolitan

METROPOLITAN Chapter of the AFS treated more than 545 foundrymen and suppliers to dinner, door prizes and a floor show Dec. 7 at the Essex House, Newark, N. J.

Those attending were unanimous in their decision that a hearty vote of appreciation be extended the committee whose efforts had provided such a wonderful party. Howard Voit, Sterling Wheelbarrow Co., was committee chairman, and his associates were: D. Polderman, Whiting Corp.; Frank Eliason, Pennsylvania Foundry Supply Co.; Ernest Miller, Bethlehem Steel Corp.; Charles Schwalje, Worthington Pump & Machinery Corp.; Daniel Talbot, Cooper Alloy Foundry Co.; Ben Beldin, Whitehead Bros. Co.; Phillip Gray, Whiting Corp.; Horace Deane, American Brake Shoe Co.; William Taylor, Taylor & Co.; William Lawson, Springfield Facing Co.; John Bing, Metropolitan Refractories Corp.; and H. Robinson, Republic Steel Corp.—*Andrew Devlin, Daniel Goff Co. Inc.*

Eye Safety Group Meets

National Society for the Prevention of Blindness, at its 37th annual meeting Dec. 13 in New York, announced it will issue a report on eye health and safety measures in iron foundries. The report, to include recommended safety practices, will be based on a study conducted in cooperation with the Gray Iron Founders' Society.

It was reported that the society's Wise Owl Club, now has 2392 members, an increase of over 65 per cent during 1951. To become a member of the club, a member must prove that his sight was saved by wearing safety glasses.

ANNUAL WISCONSIN CONFERENCE

To Be Held Feb. 7-8

WISCONSIN Chapter of the American Foundrymen's Society and the University of Wisconsin will be host to foundrymen of that area at their annual Regional Foundry Conference, to be held at Hotel Schroeder, Milwaukee, Thursday and Friday, Feb. 7-8. This will be the 15th conference sponsored by these groups.

A full program of 20 technical papers is scheduled. In addition, a general meeting Thursday morning will include a discussion of safety and hygiene in the foundry. At the first of two luncheon sessions speakers will be William W. Maloney, secretary-treasurer, AFS, and Frank G. Steinebach, editor, FOUNDRY. Walter L. Seelbach, AFS president, will address the Friday luncheon. The annual banquet will be held Thursday evening.

Simultaneous technical sessions will be held by the Malleable, Nonferrous, Gray Iron, Steel and Pattern sections Thursday afternoon and Friday morning and afternoon. The conference will open at 10 a.m. Thursday with a welcoming address by Dean M. O. Withey, College of Engineering, University of Wisconsin.

The program follows:

Thursday, Feb. 7

9 a.m.—Registration (fourth floor)

10-10:30 a.m.—Welcoming address, Dean M. O. Withey, College of Engineering, University of Wisconsin

10:30-11:50 a.m.—General meeting: "Making the Foundry a Better Place in Which To Work," K. M. Morse, director of safety and hygiene, AFS

12 noon—Luncheon Meeting—"1952 International Foundry Congress," William W. Maloney, secretary-treasurer, AFS; "Foundries in the Defense Effort," Frank G. Steinebach, editor, FOUNDRY

2:15-3:45 p.m.—

Malleable Iron: "Quality Control in the Malleable Foundry," George VerBeke, Union Malleable Iron Works, Deere & Co., East Moline, Ill.

Nonferrous: "The Cleaning Room," Martin G. Dietl, Schaible Co., Cincinnati

Gray Iron: "Basic Cupola Operation," John P. Holt, Basic Refractories Inc., Cleveland

Steel: "Steel Foundry Cleaning Room Practices," Charles W. Briggs, Steel Founders' Society of America

Pattern: "New Trends in Pressure Cast Equipment," Stephen Denkinger, Atlas Plastic & Aluminum Co., Butler, Wis.

4-5:30 p.m.—

Malleable Iron: "Application of Oxygen in the Malleable Foundry," L. H. DeWald and J. P. La Pota, National Cylinder Gas Co., Chicago

Nonferrous: "Some Problems in a Nonferrous Pressure Castings Foundry," John W. Bolton, Lunkenheimer Co., Cincinnati

Gray Iron: "Resin Binders," J. Allen Wickett, Monsanto Chemical Co., Springfield, Mass.

Steel: "Standardization of Casting Practice," A. S. Grot, Edward Valves Inc.,

Pattern: "Modern Pattern Shop Equipment," Robert Melius, Delta Mfg. Co., Milwaukee

6:30 p.m.—Banquet, Crystal Ballroom: Speaker to be announced

Friday, Feb. 8

10-11:50 a.m.—

Malleable Iron: Mechanics of Foundry Mechanization," R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis.

Nonferrous: "Production Control for Small Foundries," Harold Younger, Standard Plating Rack Co., Chicago (Tentative)

Gray Iron: "Why Test Sand," Bradley H. Booth, Carpenter Bros. Inc., Milwaukee

Steel: "Work Simplification," M. E. Annich, American Brake Shoe Co., Mahwah, N. J.

Pattern: "Pattern Engineering in Conjunction with the FEF Program," George K. Dreher, Executive Director, FEF

12 noon—Luncheon meeting: "1951 International Foundry Congress," Walter L. Seelbach, president, AFS

2:30-4 p.m.—

Malleable Iron: "The Why and How of a Preventive Maintenance Program," Thomas F. Butler, Dearborn Iron Foundry, Ford Motor Co., Dearborn, Mich.

Nonferrous: "Information Forum"—Panel: John W. Bolton, Lunkenheimer Co.; Walter W. Edens, Alloy Engineering & Casting Co., Champaign, Ill.; T. Kramer, William F. Jobbins Inc., Aurora, Ill.; Bradley Booth, Carpenter Bros. Inc., Milwaukee; A. W. Higgins, Allis-Chalmers Mfg. Co., Milwaukee

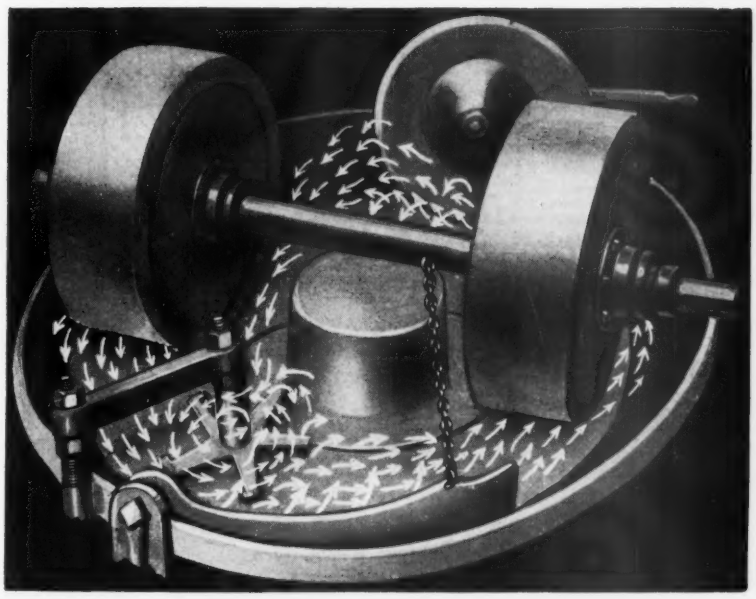
Gray Iron: "Sand, Metal or Men?" Harry Gravelin, Ford Motor Co.

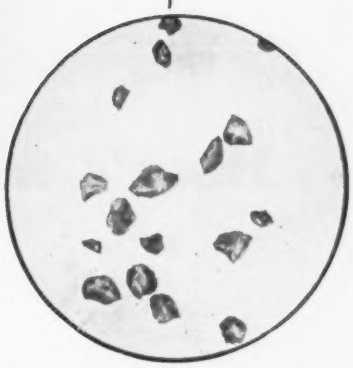
Steel: "Factors which Determine the Performance of Castings under Severe Conditions of Service," William S. Pellini, Naval Research Laboratory, Washington

Pattern: "Core Box Design and Rigging for Core Blowing," H. J. Jacobson, Industrial Pattern Works, Chicago

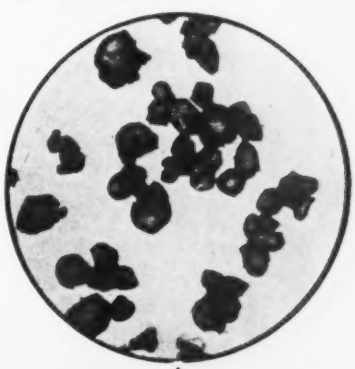
THE *Clearfield* MIXER

prepares better foundry sand





VISUAL EVIDENCE of the effectiveness of Clearfield Mixers is provided by these photomicrographs. Above, unbonded silica sand. Below, the same sand bonded in a Clearfield Mixer.



Foundry sand is composed of three principal elements, silica grains, bond and moisture. The quality of this sand depends in major part upon how well these three elements are blended. Therein lies the explanation of the outstanding performances of Clearfield Mixers.

Clearfield Mixers employ the revolving pan principle of sand preparation. The mullers are mounted on a floating shaft and revolve by contact with the moving sand. Centrifugal force together with the stirring action of the agitator and disc transform the sand from an inert mass into a fluid moving stream. The result is a perfect blend of the three elements—and foundry sand that does its job perfectly.

There's a Clearfield Mixer which will meet all your sand preparation needs. Write today for Catalog No. 79 for complete details.

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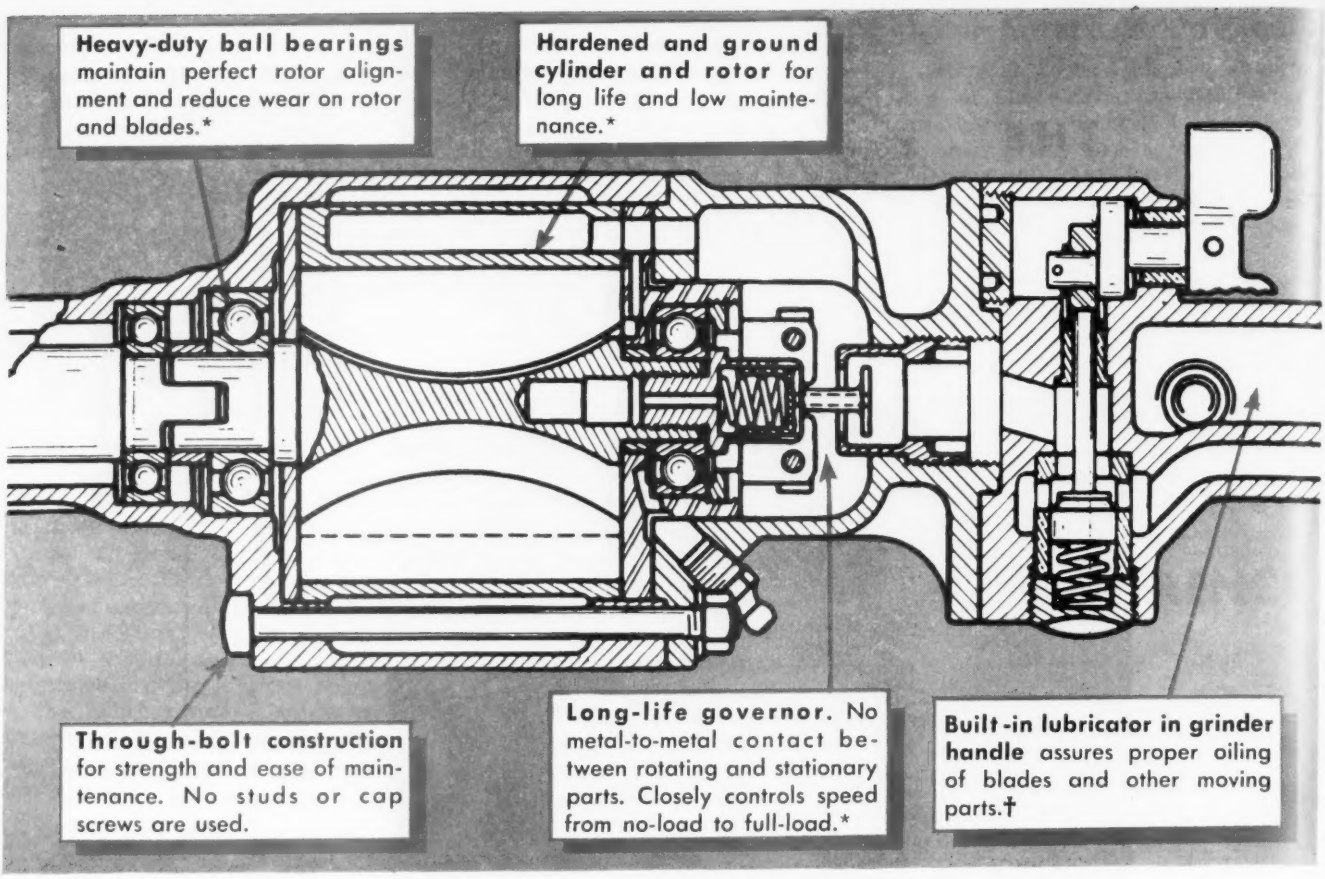
Heavy-duty ball bearings maintain perfect rotor alignment and reduce wear on rotor and blades.*
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This air motor is the biggest single reason why CLECO grinders and sanders are preferred for production grinding and finishing. It has plenty of power for the toughest jobs — plenty of speed for fast work — and a ruggedness of construction that all but eliminates maintenance.

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3058

Gouging and Cutting Torch

Uses Electric Arc and Compressed Air

By HUBERT CHAPPIE
Foundry Superintendent
National Supply Co.
Torrance, Calif.

THE Arcair process is a means of removing metal, through utilization of a torch requiring a ⅜-in. x 12-in. carbon electrode, an ordinary 300 to 400 amp dc welding machine and a quantity of compressed air.

The torch is a compact gouging and cutting torch 10¼ in. overall length. It contains an air control valve and rotating nozzle, which permits changing the electrode angle to suit the job, while maintaining the jet in perfect alignment. No gas cylinders or regulators are necessary.

The rotating nozzle holding the electrode has two small air outlet holes approximately ⅛ in. diam. This enables the air to flow parallel to the carbon electrode.

The single hose connection to the torch contains the electrical lead and the compressed air. These two leads are combined into one hose for ease of handling. This can be done any place along the line by merely taping the two lines together.

The range in air pressure used with the torch is our regular line pressure, 80 to 90 pounds. The air pressure could be as low as 60 pounds and still be effective.

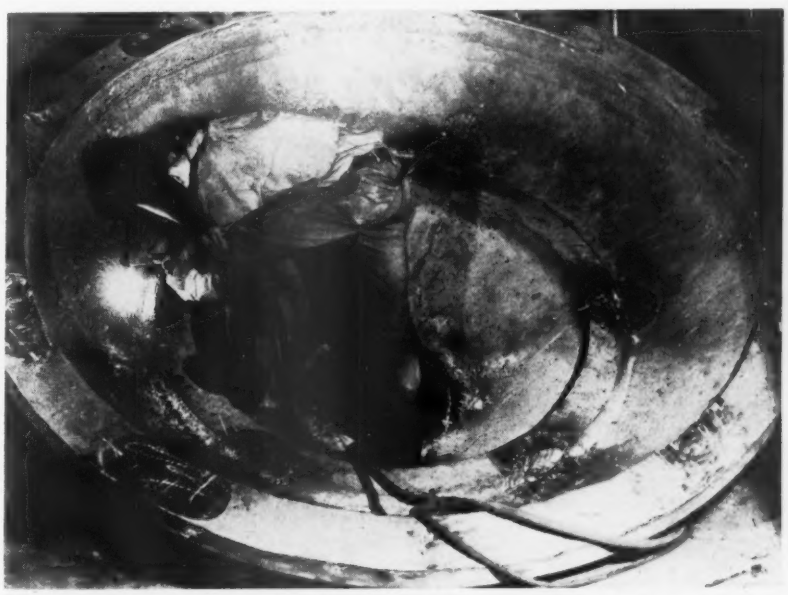
The torch is most efficient and economical when removing surface defects in castings prior to welding. Ribs, fins and riser pads can also be removed with ease. The continuous air flow results in a clean and smooth cut. The torch readily removes sand or dirt spots, and is particularly adaptable in confined corners or places where the use of a chipping hammer is impossible.

The Arcair process has an interesting background of development. According to the inventor, Myron D. Stepath, use of the torch was considered primarily for removing austenitic welds. Naval armor is welded with austenitic chrome-nickel weld metal, which does not readily oxidize, and oxyacetylene gouging or cutting is out of the question. It was extremely slow and costly when the removal of these welds became necessary. Chipping was also difficult because of the work hardening properties of the metal, and in many cases it was necessary to drill adjoining holes and grind out intervening metal.

This led to melting it out with the arc. At first gravity was depended upon to remove the molten metal, as in conventional arc cutting; however, since much of the work was in the downhand position and could not be moved, the use of the air jet to blow out the molten metal was developed in 1941. The air was operated intermittently in the first model, a small puddle of metal being melted with the arc and then the air turned on to blow it away. It was later found possible to maintain the arc in a continuous stream of air. However, this called for one man to hold the arc and another the air nozzle, and the air was directed almost parallel to the plate.

It was soon apparent that if the arc and air blast could be combined in a single torch, the operation would be much more efficient. This was accomplished when it was discovered that the process could be made to operate with the air parallel to the electrode, and a patent is based on this principle.

The first torch of combined type was made in 1948, and with it a total of 2400 feet of ⅜-in. austenitic fillet weld was removed in 20 man-days. It was first put on the market about a year ago by its manufacturer, the Arcair Co., Bremerton, Wash.



Removing padding heads from a steel casting with the torch

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The simplest test for high quality is— just look for this sack!

NATIONAL BENTONITE ALWAYS TOP QUALITY

Because National Bentonite never varies—because it is consistently top quality—many good foundrymen have made it "first choice" for bonding molds. Molds bonded with National Bentonite have high green strength plus good hot strength—they turn out better castings, since National Bentonite reduces the hazards of blows or gas holes. Better castings, finer finish castings, fewer rejects—that sums up the reasons so many foundries rely on National Bentonite.

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Since that time it has found wide use in structural fabrication, foundries, steel mills and other manufacturing plants where metal removal is required. Today 90 per cent of the torches in the field are used on mild steel.

Although the Arcair torch employs a continuous flow of air during the cutting operation, tests indicate that temperature of the steel after cutting is substantially less than when an oxygen torch is used. Other tests at the National Supply Co. show that a groove can be cut 3 ft long, ⅜-in. wide and ¼ in. deep—3⅜ cu in.—in one minute. Cost of the electrodes, compressed air and electricity in operating the torch totals approximately $1.06 an hour.

This article is a condensation of a paper presented at the sixth annual Technical and Operating Conference of the Steel Founders Society of America held in Cleveland, Nov. 8-10, 1951.

OBITUARY

RUFUS F. HARRINGTON, 61, until his retirement in 1949 chief metallurgist and general manager, Hunt-Spiller Mfg. Corp., Boston, died

RUFUS F. HARRINGTON

Dec. 29. Mr. Harrington, following graduation from Tufts College in 1913, became a chemist with Hunt-Spiller, where he successively became foundry superintendent, chief metallurgist and director of its iron and steel foundries. Active in foundry circles, he was awarded the John A. Penton gold medal of the American Foundrymen's Society in 1943 for his outstanding work in foundry sand control. He was a national director of AFS from 1933-36 and also a past president of the New England Foundrymen's Association and the Boston Chapter of the American Society for Metals.

Bayard O. Eccleston, 55, assistant to the purchasing agent, General Steel Castings Corp., Eddystone, Pa., died Dec. 24, at his home in Darby, Pa. Mr. Eccleston, with the company 20 years, previously spent 17 years with the Baldwin Locomotive Works, Philadelphia.

* * *

James M. Brown, 50, manager of the Cleveland district industrial sales office, Surface Combustion Corp., Toledo, O., died Dec. 3. Mr. Brown, a graduate of Carnegie Institute of Technology, had been associated with the company since 1927.

* * *

Oscar A. Knight, 72, until his retirement in 1945 Detroit district manager, grinding machine division, Norton Co., Worcester, Mass., died Dec. 18. Mr. Knight joined the company in 1905.

* * *

Charles F. Smith, 70, vice president, Sterling Wheelbarrow Co., Milwaukee, and president of Smith Engineering Works there since 1915, died Dec. 10 in Pasadena, Calif., following a short illness.

* * *

James R. Wyatt, vice president, Ajax Electric Furnace Corp., Philadelphia, died Dec. 2. Mr. Wyatt developed the Ajax-Wyatt electric induction furnace.

* * *

John Stanley, 58, plant superintendent, Bohn Aluminum & Brass Corp., Detroit, died there recently. Mr. Stanley had been with the company 35 years.

* * *

Harry S. Dolbey, 77, assistant to the chief engineer, Builders Iron Foundry, Providence, R. I., until his retirement two years ago, died Dec. 27.

* * *

Frank Parker, 69, metallurgist, Morris P. Kirk & Son, Alhambra, Calif., died Dec. 17. Mr Parker had previously been associated with American Smelting & Refining Co. there.

* * *

William W. Pettis, 88, founder and president of the W. W. Pettis Co., Cincinnati, manufacturer's agent for steel castings, died Dec. 7.

* * *

August J. Becker, 75, vice president, Wolverine Foundry Supply Co., Detroit, died there Dec. 1.

* * *

William Clarkson, president, Oil City Iron Works, Corsicana, Tex., died Nov. 3.

* * *

Bert Popperwell, 67, vice president, Reliable Iron Foundry Inc., Los Angeles, died Dec. 22.

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USE COMBS GYRATORY FOUNDRY RIDDLE

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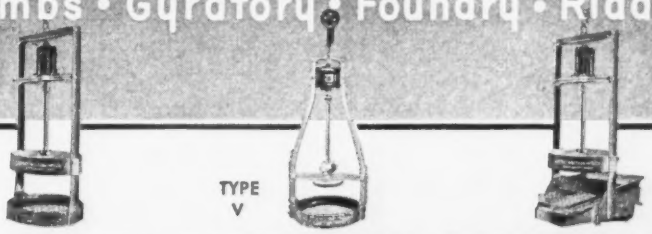


GREAT WESTERN MANUFACTURING CO.

LEAVENWORTH, KANSAS, U.S.A.

Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

EVERY once in a while, fluttering my way through a newspaper, I read an item or two on the page devoted to feminine problems, including the care of babies. I need hardly say my interest is slight and purely academic since my children are grown and quite competent to handle their own problems. They do not need—and I have not the slightest inclination to offer—advice. This attitude, I am quite sure, is highly appreciated by one and all.

In one of the items which caught my roving eye recently the inspired writer warned parents not to force their children to walk too soon and thus develop bandy or knock-kneed legs. This applied particularly to girl babies. When one of these warped specimens grew up she would not cherish the same degree of love, esteem and admiration for her parents as she would if her limbs were like those of the Venus of Milo, the winner of a beauty contest, or one of the reigning cinema glamor girls. Seeking further and unbiased expert light, I laid the propostion before Bill the other night.

"Nothing to it," he said. "If there was anything in that theory, every bandy leg molder in the country would attribute his pair of brackets to an error of judgment on the part of his parents in making him walk at a tender age while the bones were still in a more or less plastic state. As a plain matter of fact, it is universally recognized that bowlegs and humpbacks on molders are caused by carrying heavy dinner pails to work and by carrying heavy ladles of iron out to the doghouse every afternoon. Coremakers get warped from hugging the core oven door in the winter time.

"Away back in the days when I was a gay young blade flitting blithely from one job to another, I blew into the 'Light' in Lynn where Dinny Egan graciously permitted me to join his band of performers. I was doubled up on a job with an elderly, long, thin gander who had the bandiest pair of legs I ever saw on a human being. The legs looked like the front supports on a prize bulldog, or a king-size pair of calipers. After we reached the chatty and confidential stage he told me one day that his chief hobby was writing to prominent people for advice on various subjects. Over a period of years he had accumulated quite a scrap book. At my earnest request and my solemn promise not to say a word about it, he brought a specimen to the shop and allowed me to read it. The letter was addressed to a prominent foundryman:

Dear & Respected Sir: We have been requested to quote on a quantity of King Post castings for submarines. This is a little out of our line which is machinery for wildcat mines. We will appreciate any information you can give us on the most efficient method of molding these castings, also a suitable mixture of metal for pouring them.

"The reply left me kinda feebly gasping:

Replying to your esteemed communication of recent date, we beg to advise that it was extremely fortunate that you thought of consulting us before undertaking such a hazardous enterprise. The contemplated line of castings is one of the most difficult with which foundrymen have to contend.

There is a certain amount of similarity between the proposed work and that in which you are already engaged. Submarines are only seen occasionally and wildcat mines never are seen. In point of seniority the wildcat mining industry admittedly is in the lead. It has been in existence since away back, even before the golden days of '49, while the submarine has only been a recognized factor in the lives and fortunes of those that go down to the sea in ships during the past decade.

Wildcat mining machinery has been brought to a high state of development in this country. Several large and complete units have been set up in various rich mining sections of the country, notably New York, Chicago and Boston. The veins in these districts have been worked successfully for many years, but the supply of rich auriferous ore apparently is inexhaustible.

We will now consider some of the features necessary to the successful production of king post castings for submarines. Selection of a grade of sand suitable for molding castings of this description is of the utmost importance. It should conform to the strictest chemical and physical specifications. The slightest deviation from the accepted standard will play havoc with the castings. When it is realized that the king post is the center on which the submarine pivots it will be apparent to any thinking person that the slightest variation in the metal thickness, or in the specific gravity of the metal of which

(*Continued on page* 194)

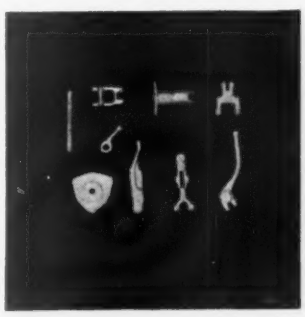
Stop the press! Artist forgot to include forked stick for locating water

Accumet Precision Castings

for all industrial uses

With Accumet Precision Castings, Crucible has developed a process of producing precision investment castings in intricate designs with the smooth, satiny finish and closely-held dimensions characteristic of "lost wax" castings. Casting tolerances start at plus or minus 0.005" although under certain circumstances closer tolerances can be held. This relatively new metal forming process solves many difficult problems in design, tooling and production of metal components.

fuel injectors from precision castings



Fuel injectors and carburetors for aircraft are mechanisms containing a variety of peculiarly shaped component parts. The usual procedure is to use hardenable, chrome stainless steels, Types 416 and 440F, which are most adaptable to easy machining. However, to save costs in machining from bars, stocks and forgings, Crucible applied Accumet Precision Castings. The close size control and good surface finish of the castings eliminate many costly machining operations — saving manpower, machine time and tooling expense.

more information available on castings

Long a leader in the development of precision investment castings, Crucible offers you the services of an alert metallurgical staff to help you profitably apply these specialty steels to your operation. Write us for more detailed information. CRUCIBLE STEEL COMPANY OF AMERICA, General Sales and Operating Offices, Oliver Building, P. O. Box 88, Pittsburgh 30, Pennsylvania.

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52 years of Fine steelmaking

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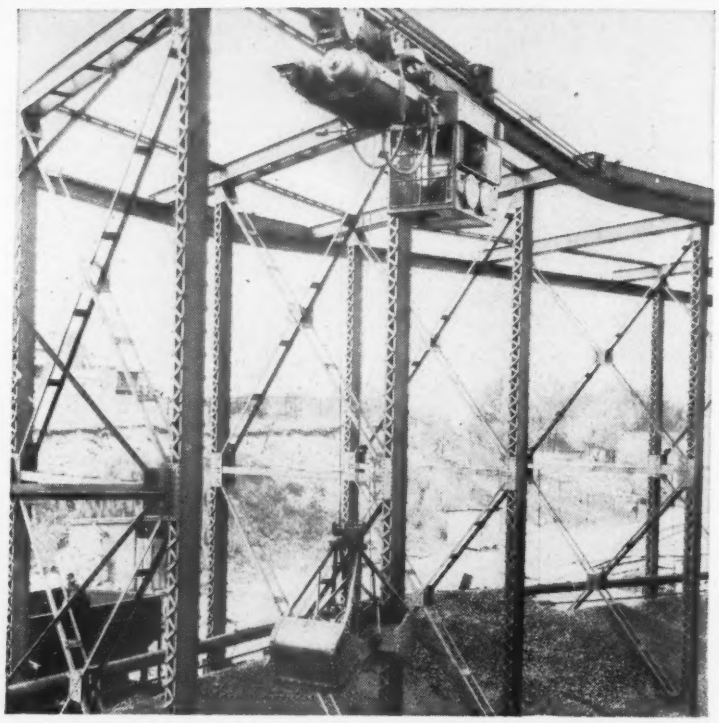
REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



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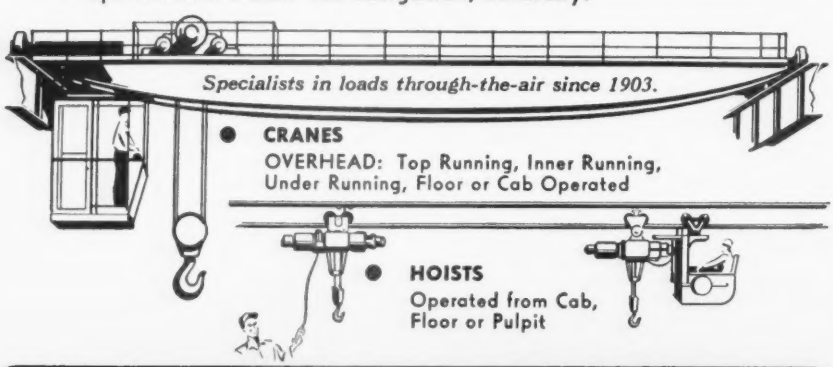
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CRANE AND HOIST CORPORATION
1314 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

(*Continued from page* 192)

the casting is composed will have an appreciable effect on the boat's evolutions.

It also must be borne in mind that the boat is destined primarily to function and operate under water, and that the pressure increases in direct ratio to the depth. Therefore, the metal must be of suitable analysis to resist hydrostatic pressure. Corrosive action of sea water, profanity at close quarters and the line of conversation handed out by the First Luff also must be taken into conversation. These are points to be touched upon again when we consider the tests to be employed in selecting a suitable metal mixture for pouring the king post castings.

A grade of light sand should be selected for making the molds. By light sand is meant one which when weighed at ordinary atmospheric pressure and temperature on a standard beam or platform scale will register approximately 16 ounces to the pound avoirdupois. If it is desired to prepare a large quantity at one time, say a ton, it will be deemed to come within the limits of this specification if each ton contains 2000 pounds. Sand not measuring up to this specification, or exceeding it, invariably should be rejected.

Color of the sand is an important item. Green sand is the most suitable, with yellow and black sand as second and third choice in the order named. Alice blue, mauve, cerise, heliotrope, vivid shades of scarlet and vermillion are not held in repute by foundrymen of experience. Some time ago a Society for The Extraction of Square Plugs From Round Holes recommended that ultra-marine blue sand should be used exclusively on marine work. The measure did not meet with approval. It was held that while the prospects for the American Merchant Marine did not look blue, that was no reason for introducing blue sand into the molding shop. The committee to which the question was referred also reported that blue had a depressing effect on the general personnel morale. It is a well known and notorious fact that the output of any shop on blue Monday always falls short of that turned out on any other day of the week.

Irrespective of its color, the sand must have a high coefficient of expansion and contraction. This means that it must not be so tight that it will squeak while the rammer is going through it. At the same time it must not be of such an open texture that the molten iron will seep through it during the pouring operation and run out through the joints and bottom board. A microscope examina-

(*Continued on page* 196)

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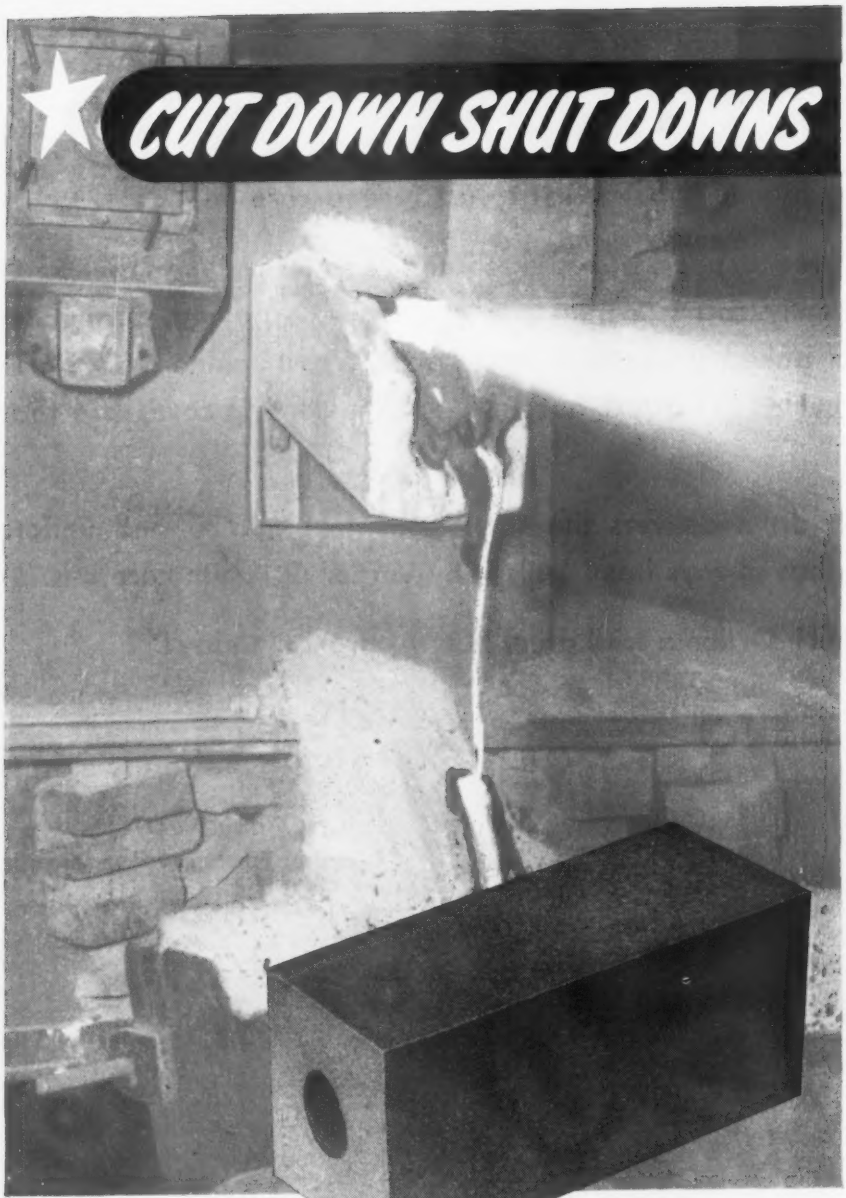

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because runs are longer, more easily scheduled.

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rapidly dissipates heat.

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because shutdowns are reduced.

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ALSO MAKERS OF FAMOUS STARRBIDE CARBON-BONDED CRUCIBLES, GRAPHITE CRUCIBLES AND SUPER REFRACTORIES.

(*Continued from page* 194)

tion should disclose grains of a uniform size, slightly angular in contour and lying in reasonably close proximity to each other. If the molder has no microscope in his tool bag or hip pocket (and it must be admitted that many otherwise well equipped artisans show a decided antipathy to investing in modern and efficient equipment of this character) he may secure fairly accurate results by applying the riddle test.

Any particles of sand that will not pass freely through the mesh of a half-inch riddle should be discarded. In some places the practice is to dispense with the riddle entirely and simply use a fine shovel. In our considered opinion this method is not sufficiently accurate and should be discouraged. It tends to retard production when the molder has to dig pieces of scrap, coke, broken gaggers and old worn-out chews of tobacco, out of the face of the mold after he has drawn his pattern.

Other characteristics of molding sand that must be taken into consideration include: Elasticity, elongation, reduction in area and the ability to withstand torsional and compression strains. A sand with a high elastic limit should not be used; first, because it cannot be packed tightly, and second because it is a menace to the life and limbs of the operator. A man using a pneumatic rammer on this kind of sand is in danger of having his kneecaps knocked off by the rebound of the rammer.

Elongation also is to be avoided. The feature in molding sand forces the ends of the slip jackets apart and produces distorted castings. Reduction in area is simply terrible. This peculiar characteristic of some sands causes a great many disputes between the molders and the shop clerk who takes up the heat. The clerk counts the number of molds on the floor and credits the molder, let us say—with 100. Next day the most diligent search discloses only 95 castings. Clearly, this phenomenon is produced by the excessive reduction in area of the sand. The sand in the molds shrunk 5 per cent between the time the heat was taken up and the time the castings were poured.

The habit which some molders have of attaching chains to their flasks and giving the craneman the high sign before the block is centered over the load has a tendency to place a severe strain on the sand in the mold. Therefore it is necessary to provide a sand that will resist this torsional and compression strain. In the event a high-grade sand is not available, ordinary sand may be used provided suitable precautions are taken to in-

(*Concluded on page* 198)

HANDY SANDY increases mold production 51%

on loose pattern work in a jobbing set-up

Send for your FREE copy of this NEW CATALOG describing the Handy Sandy. It shows how the Handy Sandy and its companion unit the Reddy Sandy will mechanize a foundry at low cost.

A-1 FOUNDRY CO., CHICAGO, ILLINOIS has found the Handy Sandy saves molding time equally as well for a jobbing foundry as for straight production work. For example, a 51% production increase has been realized on the 16" x 26" molds pictured above. Although mold sizes vary greatly up to 37" x 47", similar savings have been made on all sizes. Molds are produced using a bench operation. Swinging sand chutes are mounted under the hopper gates and are pulled into place for filling the larger flasks without moving them. The Handy Sandy is a standard twin hopper unit with the exception that the hoppers are supported from overhead to provide a completely unobstructed area underneath for varying size work.

Two molders are used — one for the cope and one for the drag. When green sand cores are required these are made on a hand floor adjacent to the Handy Sandy. The molders have no bending or shoveling as the flasks are filled without effort from the overhead hoppers. Lifting has been reduced to a minimum as the flasks are set out by cranes and conveyors.

The A-1 Foundry Company has proved that the Handy Sandy is a practical and profitable addition to the jobbing foundry for loose pattern work.

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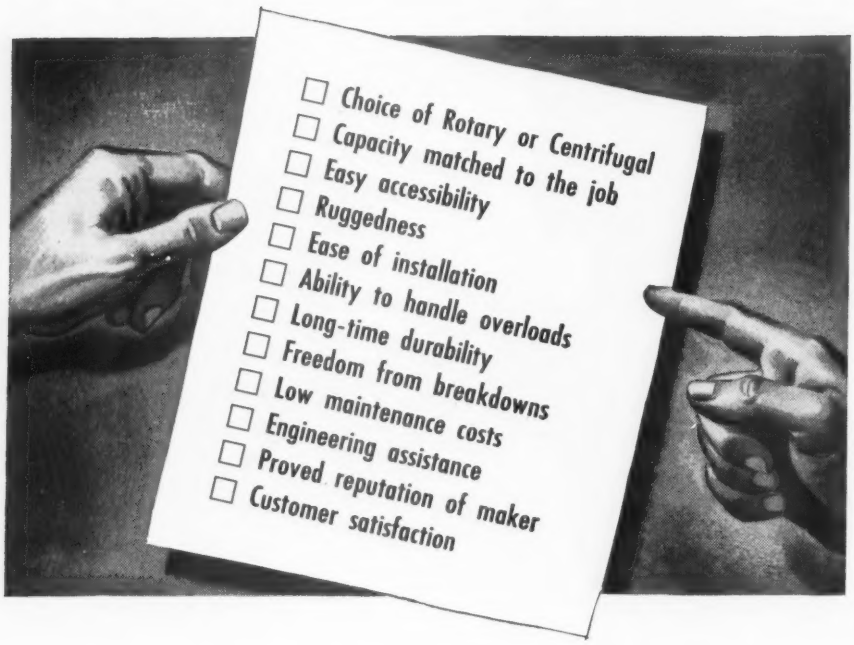

When production depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in industrial applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

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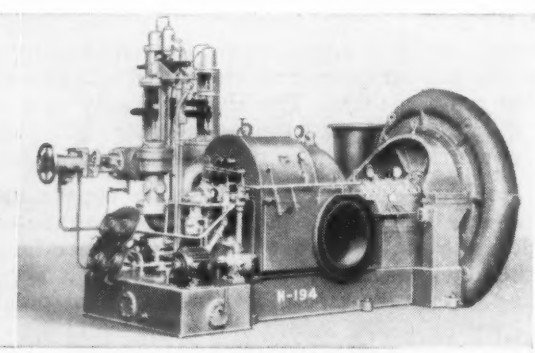

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BLOWER BUILDERS R-C SINCE 1854
ONE OF THE DRESSER INDUSTRIES

(*Concluded from page* 196)

sure a straight lift.

A simple way of doing this is as follows: A straight line is projected diagonally across from opposite corners of the flask with the aid of a surveyor's transit or theodolite. The point where the lines cross is marked with a wood stake. A perpendicular is erected from this stake according to the well known formula laid down by Q. E. D. Euclid for that purpose. The crane then is summoned either by two-fingers-in-the-mouth whistle, by mellow yodel hi-lee-hi-lo, or the ordinary full grown male bellow "Hey! 'at crane!" The operator politely is requested to lower his hook and manipulate the bridge and rack controls until the exact center of the hook coincides with the head of the finishing nail driven into the dead center of the upper end of the perpendicular stake.

Importance of selecting the proper kind of iron for king post castings cannot be emphasized too highly. The best iron for the purpose is one that has been made from ore extracted from submarine areas. We might suggest the following mixture: 30 per cent old pig; 30 per cent young pig; 30 per cent mixed foreign and domestic scrap and 10 per cent horse shoes, preferably from the hind or kicking feet.

The old pig supplies the strength and toughness. The young pig makes the metal run readily. The domestic scrap is used so that the board of directors cannot see a pile of it on their tour of inspection and thereby draw nasty inferences. The foreign scrap is used because of the well known psychological fact that far away cows have long horns. The horse shoes, it is unnecessary to point out, are added for luck.

"You must have met some queer people in your time," I said. "I wonder if you ever bumped into the Baron Munchausen?"

"I don't recall any fella by that name. Do you happen to know if he carried a card? I knew a bird in Birmingham, Alabama one time—"

"Never mind his name," I said. "I have heard all the birdie stories I want or can stand for one night."

Aluminum Powders

Reynolds Metals Co., 2500 South Third St., Louisville 1, has published a new manual dealing with aluminum powders and pastes. Among product applications covered are paints and coatings, powder metallurgy and mold washes. Physical and chemical properties, testing and evaluation methods and recommended handling and storing procedures are discussed.

John P. Frey Is Honored For Apprenticeship Work

At a special Washington ceremony Dec. 11, John P. Frey, president emeritus of the Metal Trades Department, American Federation of Labor, was presented a scroll in appreciation of his 17-years' service as labor member of the Federal Committee on Apprenticeship.

The scroll, signed by Secretary of Labor M. J. Tobin and W. F. Patterson, director, Bureau of Apprenticeship, and presented by the former, states:

"To John Philip Frey, humanitarian, distinguished citizen and eminent labor statesman . . . For his unflagging devotion to the development

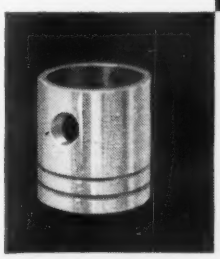
JOHN P. FREY

and perpetuation of the highest quality of craftsmanship . . . for his persistent vigilance in protecting the welfare of apprentices and in encouraging better methods for their training . . . for his wise recommendations for the development of a national apprenticeship program embodying the co-operative effort of employers, labor and public agencies . . . for the permanent contribution he has in consequence made to the welfare of the people of this nation . . . this expression of esteem is presented in behalf of the many thousands of apprentices, both past, present and to come, whose hopes, ambitions and lives will be helped by his many years of devoted service as a member of the Federal Committee on Apprenticeship."

During his career Mr. Frey has held various positions not only in labor circles and as labor advisor for the federal government, but in education. At various periods he has been president of the Ohio State Federation of Labor; chairman of the National Bureau of Economic Research; president of the Board of Education, Norwood, O.; member of

From finishing hand tools . . .

to sanding forged aluminum



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Toledo Steel Tube Co. saves time

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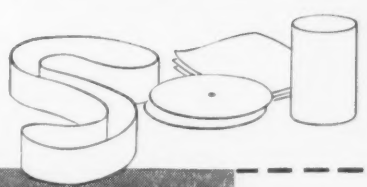
Armour has one of the most modern plants in the coated abrasives industry. Belts are only one of the many forms of coated abrasives available to you — more than 30,000 different varieties in grip size, backing, etc. Sheets, rolls, discs, tubes — and specialty sizes to meet your specifications, if you need them.

Conserve your stocks of coated abrasives. Write for our free booklet on "How to Store Coated Abrasives."

We recommend buying through your industrial distributor



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BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

HAVE YOU INVESTIGATED THEM
FOR YOUR MELTING PROBLEMS?

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

the Labor Advisory Board, National Recovery Administration; labor member of the War Production Board; lieutenant colonel, U. S. Army Specialists Reserve.

Born Feb. 24, 1871 in Mankato, Minn., he started his career as an apprentice molder in Worcester, Mass. He was elected president of the local union in 1896, and later became vice president of the International Molders Union and editor of *The Journal*. He is the author of a number of books including *Craft Unions of Ancient and Modern Times, The Labor Legislation* and *An American Molder in Europe*.

A Reliable Leaded Bronze

(*Continued from Page* 117)

alloy. The thinnest cross section was found to be ¼-in. These valves were machined and placed on a steam line for 946 hours at a temperature of 500° F and a pressure of 610 psi. One valve was removed and fractured. Examination showed no penetration of the steam, which would have discolored the fracture. Other valves were subjected to hydrostatic pressure of 4000 psi and no indication of porosity was evidenced.

It is felt that the examples quoted support the statements made regarding the alloy's usefulness.

One feature supports the fact that the 3 per cent of zinc is essential to the alloy. If leaded bronze is machined and tinned and then babbitted, good adhesion can only be obtained if the bronze contains about 3 per cent zinc; 2 per cent is not enough to permit proper adhesion.

It has been my experience over the years that the alloy under discussion is much superior to 85-5-5-5. It has better castability and gives less trouble as to internal and external shrinkage. We are learning more every day about voids in metal, and I think it would be fair to say that the term "solid metal" is only a matter of degree. We find proponents of the idea that a little gas porosity may be better for a casting that has to withstand pressure, than no gas at all. This brings up the question, do we ever get metal entirely free from gas? Personally I think not. In the matter of heavy bearings for locomotives the writer has made careful tests which indicate that the alloy gives greater mileage when its fracture shows the presence of uniformly distributed minute porosity. Actual running tests have confirmed this conclusion. The reason would seem to be that the more open metal absorbs sufficient oil to maintain more readily the much desired oil

film. Tests of the "solid" metal and of the open metal showed that the former retained a weighable amount of oil while the latter did not.

Let us now turn to the foundry operations for this leaded bronze. This alloy can be readily melted in pit fires, open-flame furnace, indirect-arc and high-frequency furnaces. An oxidizing atmosphere should be used wherever this is normal for the furnace employed.

Turnings free of oil can be melted with a proportion of solid metal. With the open-flame furnace the turnings should be placed in brown paper bags and thrown into a bath of molten metal and stirred under immediately. The appearance of the flame for this furnace operation should be of the bunsen type, not bright yellow. Such a flame gives maximum heat and avoids the possibility of reducing action. As stated previously, ¼-lb of 15 per cent phosphor copper should be used for every 200 lb of metal.

Metal Should Be Stirred

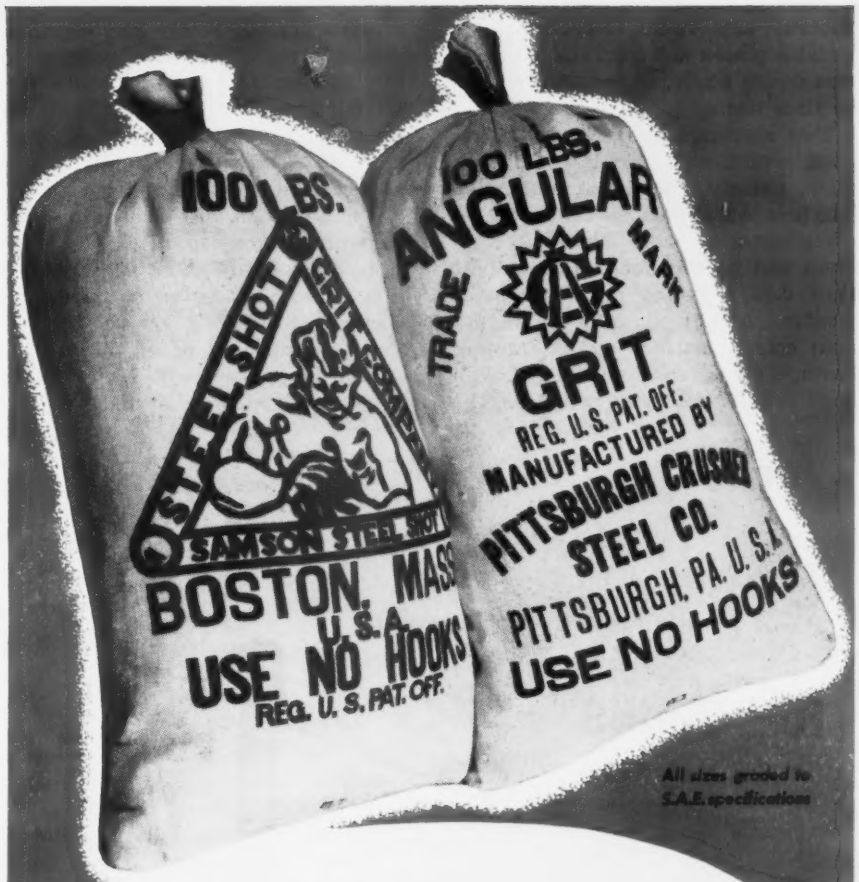
The phosphor copper should be placed in the ladle and the molten metal poured upon it. The melt should then be well stirred and allowed to rest for 2 to 5 minutes to permit the escape of excess gas in the metal, bearing in mind that the lower the temperature the less gas the metal will retain. It should be noted that under certain conditions of storage where the humidity is unusually high, 15% phosphor copper may acquire a moist green deposit. If so it should not be used. Ten per cent phosphor copper does not have this peculiarity.

Whenever practicable this alloy should be cast at 1900° F. In this connection thought should be given to enlarging the port of entry of the metal to the mold rather than raising the pouring temperature.

The molds may be either green or dry sand; skin drying is not recommended because of its uncertainty.

No core or mold wash is necessary unless especially fine cast surface finish is desired. The writer's preference is for dry sand molds for castings over 300 lb weight.

This alloy needs only moderate risers, where risers are indicated, as its shrinkage factor is low compared with manganese, aluminum, or nickel bronze, or high-conductivity copper. Semi-cylindrical castings of some 200 to 300 lb having a cross section of about 2 to 3 in. can be cast without a riser as the alloy seems to have an unusual capacity for self adjustment during solidification. However, the best procedure when starting a run of a new casting is to make it first



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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

without any risers, fracture it in suitable places and from the examination decide where, and to what extent, to place risers.

Two elements are very inimical to good results with the leaded bronze alloy, namely silicon and aluminum. The presence of 0.05 per cent of either gives metal of badly discolored fractures and poor surface as cast. Less than 0.05 per cent may give some trouble. Aluminum gives an aluminum colored surface and a fracture having areas from black through dark reddish brown to greenish. The crystals are but poorly knit together. Silicon gives chalk-white patches on the casting and a very badly discolored and weak fracture. If silicon is present, and the gate watched during pouring, a fine smoke will be noticed that spirals up the gate and deposits whitish dust around the gate and sprue. This deposit will be found to be lead silicate and a large proportion of zinc oxide, as one effect of silicon is to throw out zinc as oxide. The flat surfaces of castings when silicon is present will be found to have a worm-eaten appearance.

When difficulty is experienced in the making of a casting from a new pattern and in some other alloy, it is worth while trying the alloy discussed, and, if it fills the bill, to then endeavor to get the customer to accept the change in metal specification.

FEMA Issues Yearbook

The 1951 yearbook of the Foundry Equipment Manufacturers' Association, Engineers Building, Cleveland, features reports on the various activities of the group. Marking the 33rd year of the association, the cover illustrates the emblem and presents the slogan of the organization, "A Mechanized Foundry Benefits Everyone." A foreword traces the progress of the group, and lists the original purposes which motivated the forming of the organization.

Other data include a listing of the officers, directors and committee members; past presidents and past executive secretaries; a report on the year's activity; constitution and bylays, a membership roster; and a membership classification. This yearbook is published with a larger page size than formerly.

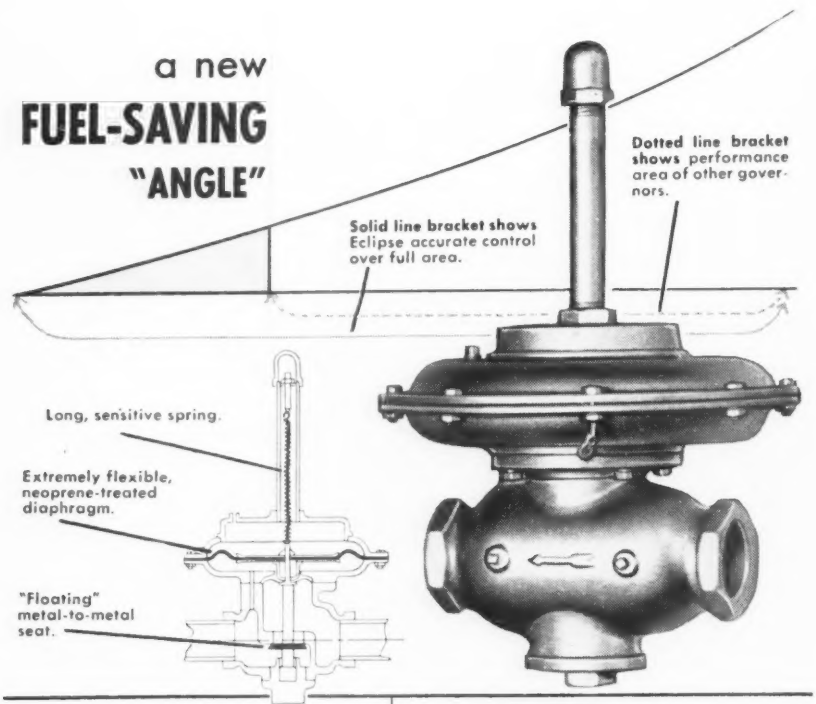
Book Review

Foundry Work, by Edwin W. Doe, chairman, metal trades department, Brooklyn Technical High School, Brooklyn, N. Y.; Fabricoid; 109 pages 6 x 9 in.; published by John Wiley & Sons Inc., New York; price $1.76.

This book has been prepared in cooperation with the Textbook Committee of the Educational Division of the American Foundrymen's Society for use in high schools. The text has been prepared to teach the simple principles of foundry practice, first by referring to several phases of the industry in a general way, designed to arouse interest in the subject, and secondly by presenting a series of molding problems that will exemplify the application of this knowledge in a practical manner.

Text and illustrations are presented under nine chapter headings: The Foundry Industry, Fundamental Foundry Processes, Foundry Tools and Equipment, Patterns, Sand Molding, Baked Sand Cores, Melting and Pouring Metals and Alloys, Cleaning and Finishing Castings, Occupational Advantages in the Foundry. The concluding six pages cover a glossary of foundry terms, references and visual aids and an index. Within its admittedly limited range, the book provides approximately all the information the average high school student can absorb in his school period.

a new
FUEL-SAVING "ANGLE"


Dotted line bracket shows performance area of other governors.
Solid line bracket shows Eclipse accurate control over full area.
Long, sensitive spring.
Extremely flexible, neoprene-treated diaphragm.
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Yellow "angle" area shows "golden opportunity" for dollar-saving with Eclipse Governor.

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ZERO GAS GOVERNOR
Maintains Economical Air-Ratio over the Entire Operating Range of the Burner.

It will pay you to check your present zero governor, to see if it provides the proper air-gas ratio and precision control, all the way down to the minimum gas flow, to make sure you are not sacrificing important ranges of operation.

The McKee ECLIPSE Zero Governor is a low-pressure, proportional mixer, specially designed with extremely sensitive springs and diaphragms (illustrated above) in order to accurately control even a very small amount of gas flow.

This precision control at *all* operating ranges means a dollar-and-cents saving for users of McKee ECLIPSE Zero Governors. Gas-burning installations, whether single or multiple burner, are usually engineered to operate at specific temperatures, and often at a minimum firing rate. Consequently it is highly important to have a governor, such as the McKee ECLIPSE, that is highly sensitive to even the slightest gas flow. With all their precision construction, these governors are sufficiently rugged to meet drastic requirements of everyday combustion equipment operation.

Write for descriptive bulletin M-400, which includes technical data and specifications. Or see Sweets Product Designers' or Process Industries Catalogs.

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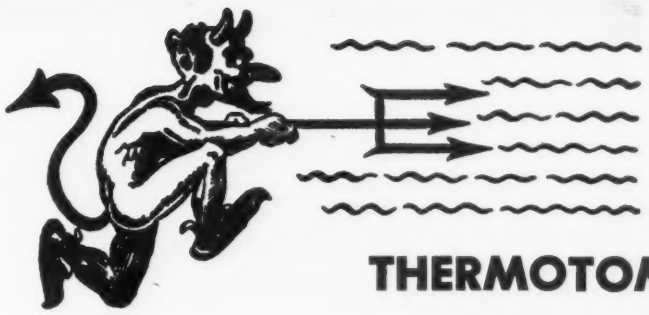

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(Patented)

and EXOTHERMIC CARBON FREE LIQUIDIZERS

Keeps metal molten!

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THERMOTOMIC is a patented Exothermic compound that can be molded into any desired shapes and used as feeding inserts under risers or as facing application where it is desired to maintain fluidity of the casting metal. THERMOTOMIC permits reversal of the trend towards large feeding heads and risers, making it possible to use heads that are shorter and more compact with very small feeder openings. This permits easy removal of heads and gates and sharp reductions in cleaning and finishing costs. When THERMOTOMIC is used as inserts or as facing in the mold, heat at thin metal sections is retained until the main body of the casting has solidified, thus eliminating shrink cracks and improving grain structure and tensile strength.

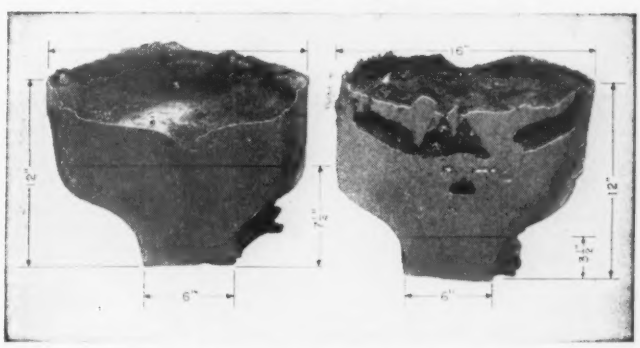
300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.

Thermotomic ABC and AL-X31 for Aluminum and Magnesium Castings

THERMOTOMIC ABC is the first successful exothermic feeding compound ever to be developed for aluminum and magnesium castings. Results obtained from its use are amazing. Feeding metal in heads or risers is maintained in the fluid state for 20 to 30 minutes. Great savings are effected through reduced riser dimensions. Feeding heads or risers are reduced in volume 80% and more, and their removal from the casting is greatly facilitated due to the restricted feeding necks.

SOFFEL'S AL-X31 LIQUIDIZER was developed for use in conjunction with THERMOTOMIC ABC. In order to secure best results and maximum feeding, we strongly recommend that AL-X31 LIQUIDIZER be applied on the feeding heads or risers. When so applied, AL-X31 LIQUIDIZER enters into an intense exothermic action which will actually raise the temperature of the feeding metal. The heat produced is sufficiently great that, even if the metal has solidified, it will re-melt. After AL-X31 LIQUIDIZER has completed its exothermic action, it forms a soft, insulating cover on the feeding metal. This cover confines the heat generated and further delays solidification of the feeding heads or risers.

SOFFEL'S CARBON FREE LIQUIDIZER PRODUCES GREATER YIELD



Steel Riser on left contains twice as much sound metal

These risers, made in the same mold, illustrate how Soffel's Carbon Free Liquidizer produces sounder castings and saves metal. The riser on the left, on which Carbon Free Liquidizer was used, contains more than twice as much sound metal as the riser on the right on which a common carbonaceous pipe eliminator was used. It is readily seen from this that the use of Soffel's Carbon Free Liquidizer permits substantial reductions in size of risers.

BEWARE OF IMITATIONS: We are the originators of Exothermic Carbon-Free Liquidizer.

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Fig. 1—General view of small Chevrolet foundry where nickel anodes are cast

Castin

LARGE requirements for nickel anodes employed in plating radiator grilles, bumpers and other parts for Chevrolet cars and trucks led to the installation of a foundry for casting these anodes at the Chevrolet-Flint Manufacturing Division plant of General Motors Corp. Although the foundry is small and is run by a few men, its capacity exceeds that needed in the plant where it is located, hence anodes are cast for certain other General Motors plants that also have sizable nickel plating installations.

Most of the foundry can be seen in Fig. 1 which shows the two rocking type electric indirect arc furnaces used for melting, the set of cast iron molds in a pit in the center of the floor and some auxiliary equipment, including a steel barrel in which the anodes are tumbled to remove fins left at the mold parting. Pouring is done from hand ladles. Eleven heats a day are commonly run.

Each heat includes 930 lb of nickel, partly cathode sheet nickel of 99.98-per cent purity and partly scrap in the form of ends left from used anodes that are returned from the adjacent plating department. Charcoal is charged to add carbon. Magnesium is also employed to scavenge the ladle. Furnaces are lined with sillimanite and have to be relined once in about 500 heats but the lining is patched as may be necessary between relinings. Fig. 2 shows a close-up of one furnace being tilted to fill a hand ladle.

Fig. 2—Tapping electric furnace into hand ladle from which metal is poured at 2800-3000°F into iron molds

All anodes produced are 72 in. in length, weigh 73 lb. each and have a conventional rounded but somewhat flattened sectional shape. The anodes taper from the top toward the lower end to facilitate removal from the iron molds which are made in two halves parted at the center. Molds are held together securely by square steel rings and wedges.

All molds are stood on end in a pit with the upper ends about 2 ft above the floor, at convenient height for pouring, Fig. 3. Most of the pit is covered by removable gratings with gaps left where molds pass through. Each mold half contains half of the cavity and the parting is a flat face in a vertical plane. The cavity widens

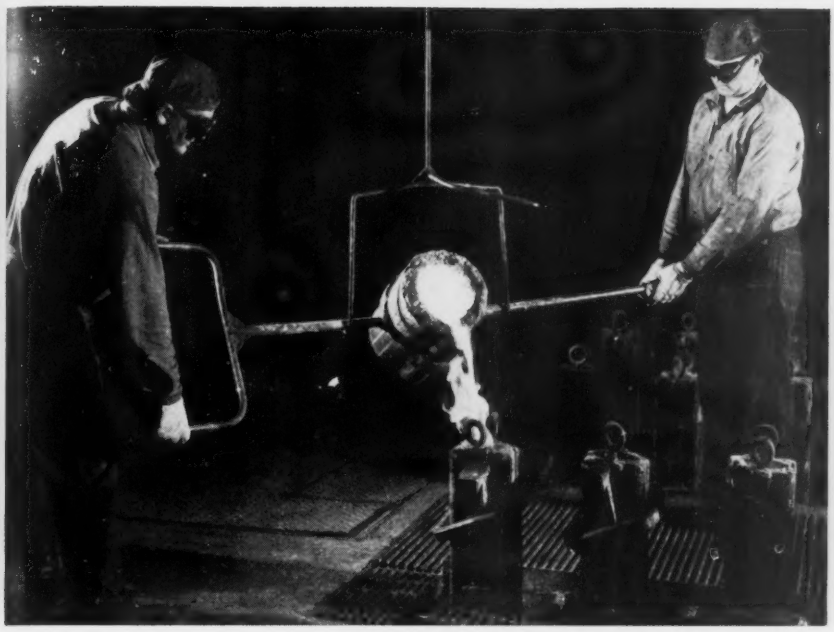


Fig. 3—Pouring metal into cast iron mold. Molds are over 6 ft long and are set into a pit partly covered by grating

Fig. 4—Half mold lifted from pit is given refractory wash to protect inner surface and prevent casting from sticking

Nickel Plating Anodes

By HERBERT CHASE

near the top to provide a somewhat funnel-like pouring mouth.

As the molds have a thickness of about 3 in. perpendicular to the parting face and are about 75 in. long and 7 in. wide, they are quite heavy, hence each half has an eyebolt to facilitate handling by a trolley hoist. Halves are hoisted out of the pit about once in five heats so that all inside surfaces, including parting faces, can be given a coating of wet sillimanite appled with a brush, as in Fig. 4. Between all heats, the upper 18 in. of the mold interior, which becomes hottest, is similarly coated but without hoisting out of the pit. The coating is highly refractory and helps to protect the mold surface from heat checking besides keeping the castings from sticking to the molds.

A further safeguard against sticking is to drop two moth balls into each mold just before it is filled. The naphthelene smoke produced when the hot metal strikes the balls helps to coat the walls with carbon. Molds have a life of about six months.

Pouring is done with the molten nickel at 2800-3000° F from a hand ladle. As soon as the castings are solidified, the rings and wedges holding mold halves together are knocked loose and castings are lifted out by tongs, using a trolley hoist, and are transferred to a quench tank where they are cooled before being shifted to the tumbling barrel. The latter is lined with nickel plates so that any metal abraded and returned, with flash ground off, to the melting furnaces will not be contaminated with iron.

Tumbling continues only long enough to remove flash and sharp edges, after which each anode removed has a hole drilled and tapped in its bottom end to receive the hook by which the anode is later supported in the plating tank. Drillings and all other scrap are collected for remelting. All nickel ingots and scrap anodes received by the foundry are weighed in and all new cast anodes delivered are weighed out so that a constant check is maintained on metal utilization.

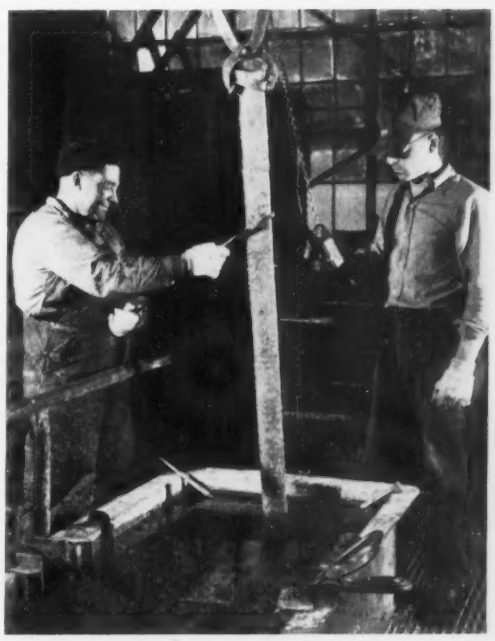


Fig. 5 — Quenching newly cast nickel anode. After cooling castings are tumbled to remove flash formed at partings

Modernization Without Mechanization

(*Continued from page* 116)

extended over a much longer period of time it would not be practical to have a separate pouring crew. However, several malleable foundries with continuous melting facilities pour for the full shift by using separate pouring crews. The increased production per molder approximates 30-35 per cent. Fig. 1 shows the pouring devices used. The malleable iron is grade A—35,000 psi yield point, 18 per cent elongation, 55,000 psi ultimate strength. Yield is approximately 48 per cent good castings.

Molding is on portable jolt squeeze and jolt, squeeze, pin-lift molding machines which are moved by the molder along the windrow of sand. The average production is approximately 160 molds per man for 6½ hours. Some floors, without cores, produce as many as 270 molds. All sand is hand shoveled and molds are placed on the concrete floor. Aluminum matchplate or cope and drag patterns are used with slip or pop-off aluminum flasks. Cores are delivered to the molders in boxes on racks, as required, via the monorail system and stored adjacent to the molder. With approximately 25 molders, 37 different patterns are run daily.

A night crew separates the castings from the sand, sprues the castings and the sprue is delivered by truck to the charge make-up area. The castings are placed in buckets and delivered to a cleaning and sorting area via the monorail system or by lift truck. The sand is lightly wet down to reduce dust and, by means of a truck with scoop (Fig. 5) is delivered from the floor to the receiving hopper of a screening and magnetic separator unit (Fig. 6). The cleaned sand is delivered by belt to a scrap hoist bucket loader which loads the muller. After 45 seconds mulling with bond and moisture added, the sand is dumped on the floor. The scoop truck, after dumping the load of dry sand, returns a load of prepared sand to the molder's floor and leaves it in a windrow ready for use. The removal from the sand of core butts, metallic and other refuse, plus mulling, provides each floor with proper sand for smooth-surfaced castings free of sand defects. Properly prepared sand also assists the molder to achieve maximum production.

Sand Conditioned at Night

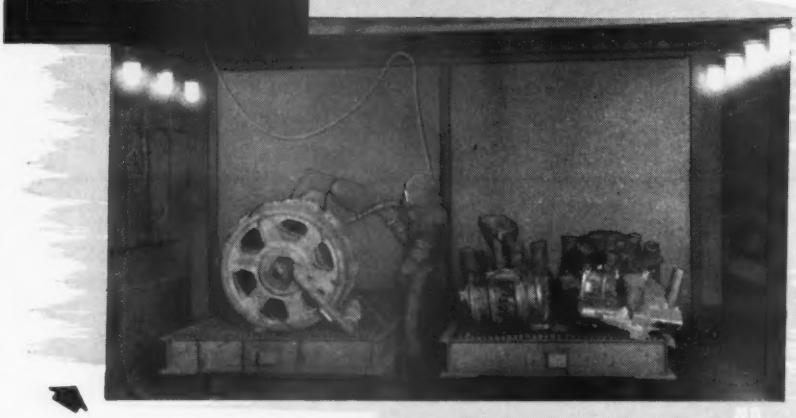
Nine or ten men perform the night crew operations, requiring about four hours for malleable and four hours for gray iron operation. About 400 tons of sand are conditioned each night and approximately 53-55 tons of castings are sprued and delivered to the cleaning and sorting area. All work is on incentive wage payment plan. The sand preparation units are utilized in the daytime for special facing sands, as required.

Patterns and coreboxes are rigged for maximum unit production. Cores are delivered to the molder ready to set without rubbing or fitting. Molding machines, flasks, etc., are maintained in first-class operating condition to minimize interferences to production. The pattern and core rigging is designed to permit machine operators to produce a maximum number of clean, sound castings without previous molder's training. Proper engineering and planning reduce interferences to production and insure castings true to tolerances and weight allowances without excessive work in the cleaning and finishing departments.

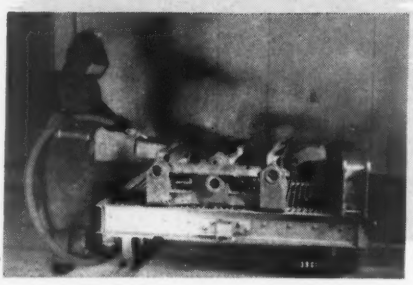
Castings are delivered to the clean-

(*Continued on page* 208)

SLY ARMOURED* BLAST ROOMS



A 16′ x 16′ Sly Blast Room with double track for two cars. Both cars can be used for a single large casting. Note how perforated floor plates keep coarse refuse from entering hopper below.



This view shows a Sly Blast Car in a Sly Blast Room. Perforated floor plates are supported by grating preventing plates from warping. Observe how tops of rails are flush with floor. Operator wears a Sly "Purair" Helmet.

Whatever Size Your Castings

And whatever your tonnage we have a standard blast room to suit. We have built blast room equipment for the cleaning of the inside of tank cars, for large airplane fuselages, for structural assemblies, tanks, railroad cars and locomotives. Some large blast rooms are self-contained buildings.

STANDARD SLY BLAST ROOMS

Inside width: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft. • Inside Length: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft. Inside Height: 7 ft. 3 in., 8 ft. 3 in., 9 ft. 3 in. • Larger Blast Rooms for special purposes.

***ARMOURED** An extra layer of detachable 3/16″ steel wear plates to protect the walls. • An extra layer of steel grating to reinforce the floor against sagging. (Exclusive Sly features)

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OSBORN AUTOMATIC CONTROLS CUT CORE BLOWING COSTS!

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PRODUCTIVE . . . double-box operation . . . permits operator to draw core from one box while another core box is being blown.

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VERSATILE . . . can be used on diaphragm or draw type Osborn Core Blowing Machines.

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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

(*Continued from page* 206)

ing room in dump buckets handled either on monorail or by lift truck as shown in Fig. 7. The castings are cleaned in one of three airless blast units, as shown in Fig. 9. After cleaning the castings are discharged to boxes and placed in storage on roller conveyor for subsequent delivery to chippers and grinders who work from full to empty containers (Fig. 10). Most of the malleable iron is not cleaned in the hard but is sorted, chipped, inspected (hard iron scrap approximately 6 per cent) and delivered to the pot packing stations. The failure to clean hard iron results in slightly higher soft iron scrap (approximately 3 per cent) because it is not possible to see all the defects on the dirty castings.

The pot packing unit consists of a shakeout booth in which stacks of pots are shaken out. The bottom pot is clamped and the bottom removed by the truck, after which the castings and packing material flow by gravity onto a shakeout, which separates castings and delivers them to buckets on a monorail. The packing material is elevated screened and cleaned by air exhaust, and delivered into a storage bin with two outlets. The pot packing stations are provided with hydraulic elevating devices to permit packing four high at convenient height. After the castings are placed in the bottomless pots, packing material is added by gravity and vibrated.

When the stack is complete and mudded, the trucker delivers the stack into the annealing oven and places the previously emptied stack on the elevator. All the hot, dusty, heavy work ordinarily associated with packing and unpacking for annealed castings is eliminated and four men do the work formerly performed by 11. See Fig. 11 for pot packing unit. The life of the pots is increased approximately 50 per cent and cleaner castings are obtained with clean packing materials. As much as ten hours was reduced from the annealing time by more rapid heating and final cooling.

After annealing in powdered-coal-fired batch ovens, the castings are blasted, chipped, ground and inspected as outlined in the foregoing. All grinding and chipping is on incentive wage payment and only six grinders are required.

Approximately 16 coremakers using benches, bench blowers and larger blowers produce approximately 13 tons of good cores per day. Core sand is mulled and delivered to the coremakers. Rack type, recirculating, gas-fired ovens are used to bake the cores. Ten men are required to service the coreroom, finish, box and store the cores for delivery to the molders. All work is on incentive wage payment plan.

This plant has been studied to determine the economic justification of

(*Concluded on page* 210)

Save Money
IN YOUR FOUNDRY

SEE YOUR NUGENT SAND REPRESENTATIVE FOR PROPER CORE SAND RECOMMENDATIONS

Sand has gone scientific! Today modern foundries can rely on their sand suppliers for the proper recommendations to meet their specific needs. Cannon Brand Core Sand is being tested and improved continually by up-to-date laboratory methods to guarantee highest foundry standards. Guesswork is eliminated at our plant—not yours.

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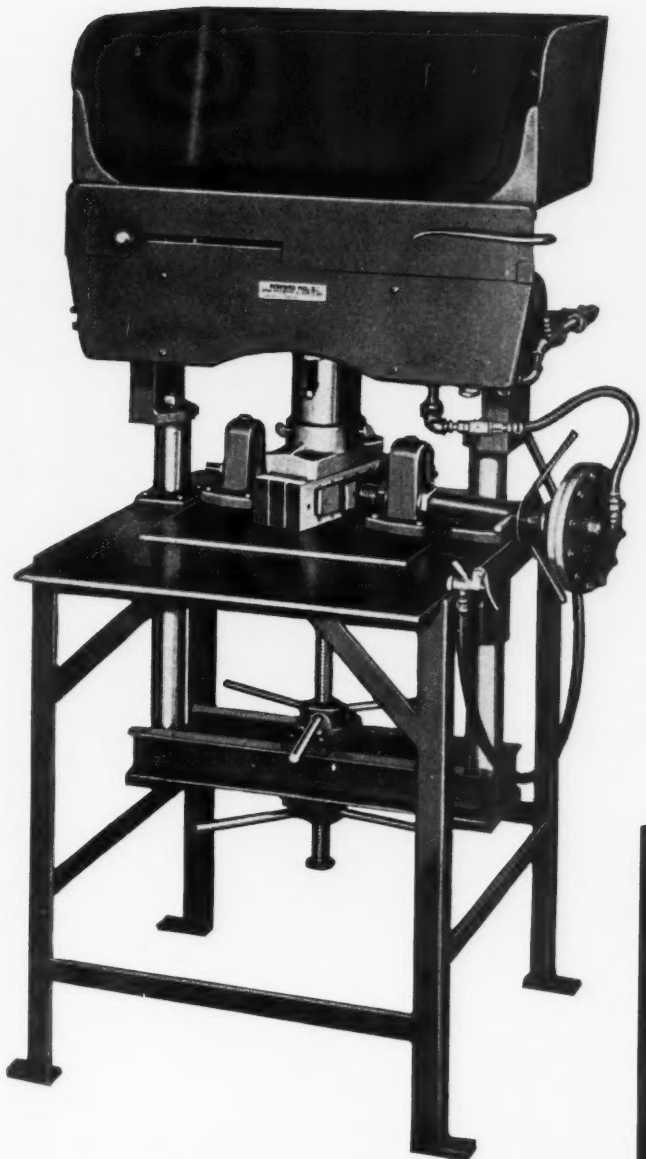
another CANNON core sand *product*

THE NUGENT SAND COMPANY, INC. *Since 1912* MUSKEGON, MICHIGAN

"Plenty of mustard on mine, Nick!"

Redford CORE BLOWERS



REDFORD NO. 2 STATIONARY MAGAZINE TYPE CORE BLOWER . . . . .

New standards are being set with this machine, because every motion of your operator has been correctly evaluated to obtain a maximum of production with a minimum of effort.

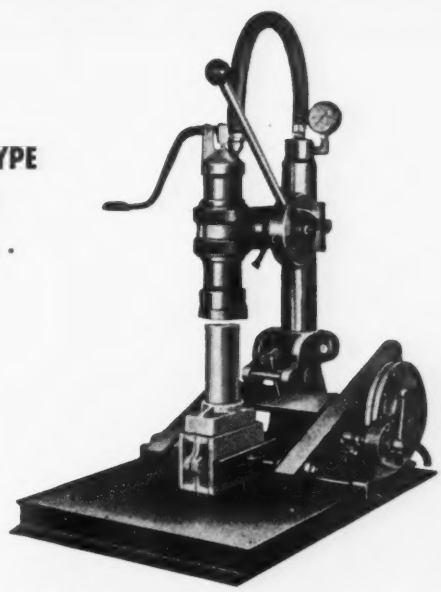
8 OUTSTANDING FEATURES:

1. Large stationary work area.
2. Large sand supply hopper.
3. Stationary sand magazine.
4. Easy accurate locating of core boxes.
5. Quick change magazine heads.
6. Quick adjustment for different height core boxes.
7. Quick change, fully adjustable, vertical clamping attachment.
8. Actuating one handle clamps the core box, blows the core and releases the core box, in two seconds.

CAPACITY: Cores up to 5#

Write for Specification Bulletin "F"

REDFORD CARTRIDGE TYPE BENCH CORE BLOWER . . . . .



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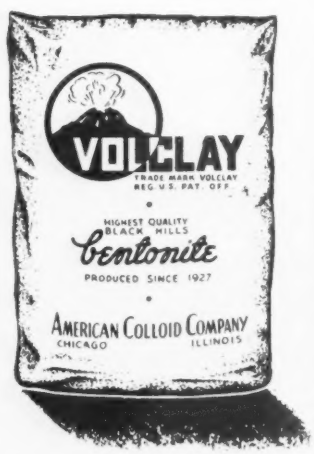
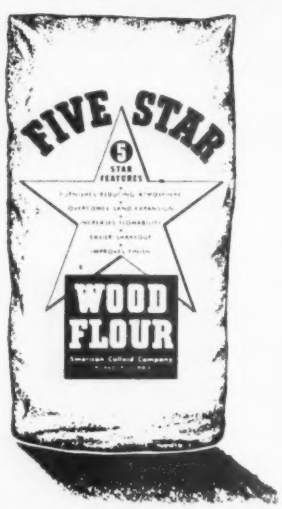
(*Concluded from page* 208)
mechanization to eliminate shoveling and carrying the molds and to provide continuous metal in the malleable foundry. On the basis of present costs per man-hour and the man-hours which can be eliminated by mechanization, the required investment would not be amortized in a reasonable length of time unless total tonnage also is increased to spread overhead more thinly.

It is unusual that a mechanization program for this size operation will not permit reduction in labor costs to amortize the investment in approximately three years of operation. Management and labor, working together, have established a set of conditions by the class of work and production that is an outstanding example of modern, low-cost operation without mechanization, but with considerable motorization, excellent control of variables affecting quality and production and an incentive to work instilled in the men.

In Europe where the wages are low compared to the United States and the operations largely of a jobbing or jobbing production nature, the degree of mechanization that is economically justified is definitely limited. If foundries are merged to provide larger units, some of those units will warrant mechanization. All of the units warrant modernization and supervision which encourages maximum unit production. It is only by producing more per unit of time that real wages can be increased and costs truly reduced.

On its simplest definition the foundry problem is one of material handling, plus control of processes to secure sound castings. It does not require large sums of money to operate a modern, efficient, low-cost foundry. It does require good management and supervision, careful planning of standard practice procedures to insure most efficient methods, proper material handling and sand conditioning equipment to permit service operations with minimum labor cost, engineering, selective selling at proper prices and, last but not least of importance, an incentive in the form of more take-home pay to willing workers to give a full day's production for a full day's pay.





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Book Review

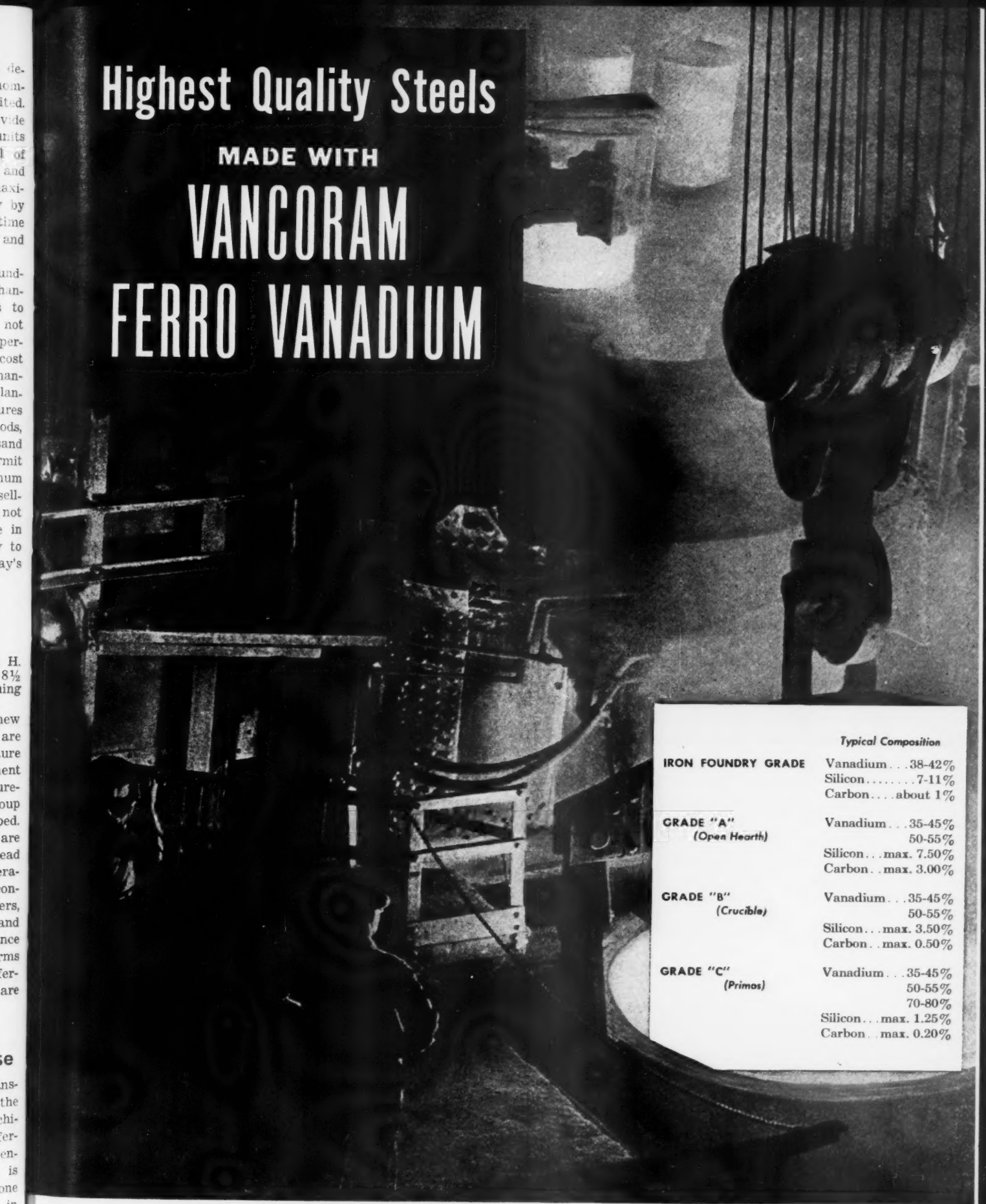
Modern Pyrometry, by Charles H. Campbell, cloth, 155 pages, 5¼ x 8½ in., published by Chemical Publishing Co., New York. Price $4.

Fundamental principles and new techniques in pyrometric practice are discussed. To give an overall picture of the techniques used and equipment available for temperature measurement and control, a selected group of pyrometric systems is described.

Among the topics covered are types and uses of thermocouples, lead wire and protection tubes; temperature indicators, recorders, and controllers; resistance thermometers, mercury, and bimetallic systems; and applications, care and maintenance of pyrometers. A glossary of terms used in automatic control and references on the latest developments are included.

Offers Ventilation Course

Michigan State College, East Lansing, Mich., in co-operation with the Division of Industrial Health, Michigan Department of Health, is offering a short course on industrial ventilation Feb. 25-28. Course fee is $25, including one banquet and one luncheon. Rooms are available in Kellogg Center on the campus. Course reservations should be made to Continuing Education Service at the college.



	Typical Composition
IRON FOUNDRY GRADE	Vanadium . . . 38-42% Silicon . . . . . 7-11% Carbon . . . . about 1%
GRADE "A" *(Open Hearth)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 7.50% Carbon . . max. 3.00%
GRADE "B" *(Crucible)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 3.50% Carbon . . max. 0.50%
GRADE "C" *(Primos)*	Vanadium . . . 35-45% 50-55% 70-80% Silicon . . . max. 1.25% Carbon . . max. 0.20%

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VANCORAM

CHEMICALS AND METALS

Gates and Heads For Steel Castings

(*Continued from page* 99)

core is the feature of the method covered by the original patent.

As first developed, the core was generally vented from end to end, and extended from the center of the upper part of the head to the surface of the mold. Atmospheric pressure thus admitted to the interior of the head is sufficient to prevent the metal from flowing by gravity from the casting into the head; instead, the direction of flow is reversed, and the formation of a shrinkage cavity in the casting is prevented by the metal thus forced into it. Theoretically, such an "atmospheric pressure head," as it is now generally called, can force steel into a casting to a height somewhat over 4 ft, but in practice it has been found that the casting should extend not quite 2 ft above the top of the riser if it is not to be partially unsound.

There have been many modifications of the original scheme, and it has been found that it is not necessary to use a hollow core that reaches to the outside of the mold, so long as its inner end extends well into the interior of the head. The outer end may terminate in the sand, and a full vent is not required because the material of both the core and the mold is sufficiently porous to allow atmospheric pressure to act. Indeed, a sharp-edged notch in the upper surface of a blind head frequently will suffice, the pressure of the air serving to burst in the thin skin of solidified steel, as soon as the drop in the level of the liquid metal inside the head starts the formation of a vacuum. In one adaption of the method, the core used to form the opening into the head is made ring-shaped and is so set as to surround the bottom of the pop-off, as shown in Fig. 26.

Employ Graphite Rod

In some shops, a graphite rod has been used in the blind head, with the object of raising the carbon content of the steel so that it will remain liquid longer. This method involves the risk of getting high carbon metal into the casting itself, and is only effective when the steel entering the riser is quite hot, since cooler metal will not absorb carbon from solid graphite quickly enough to obtain the desired result. Another method is to place mildly exothermic pipe eliminator in paper cups in the head, so as to increase somewhat the metal temperature. Modified thermits cannot be used in this way, as the reaction is too violent to be safely carried out in a confined space, and many of the mildly exothermic compounds do not generate enough heat to increase the effectiveness of the blind heads very much.

In using the Williams method, it is essential that atmospheric pressure be admitted only to the bottom-attached head, so that the desired "barometer effect" may be obtained to force metal into the solidifying casting. The method is best suited to the production of castings of such size and shape that they can be made sound by one or more bottom-attached heads, fed by suitable gates. When the casting requires open heads to make it sound at some point not fed from the blind heads, the metal must freeze quite early between the two sets of heads, to keep atmospheric pressure on the open heads from balancing that in the blind ones, and so rendering the latter ineffective. Disregard of this rule will always result in an unsound casting.

To secure the best results with

(*Continued on page* 214

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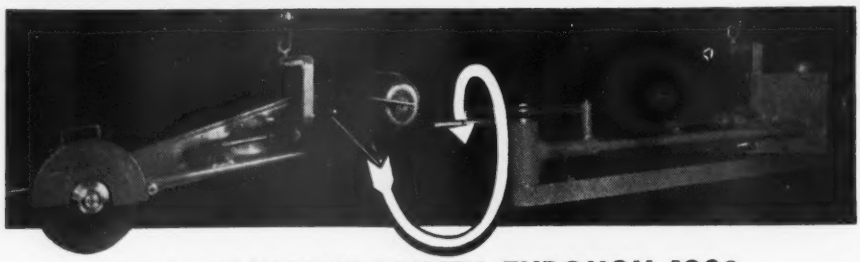

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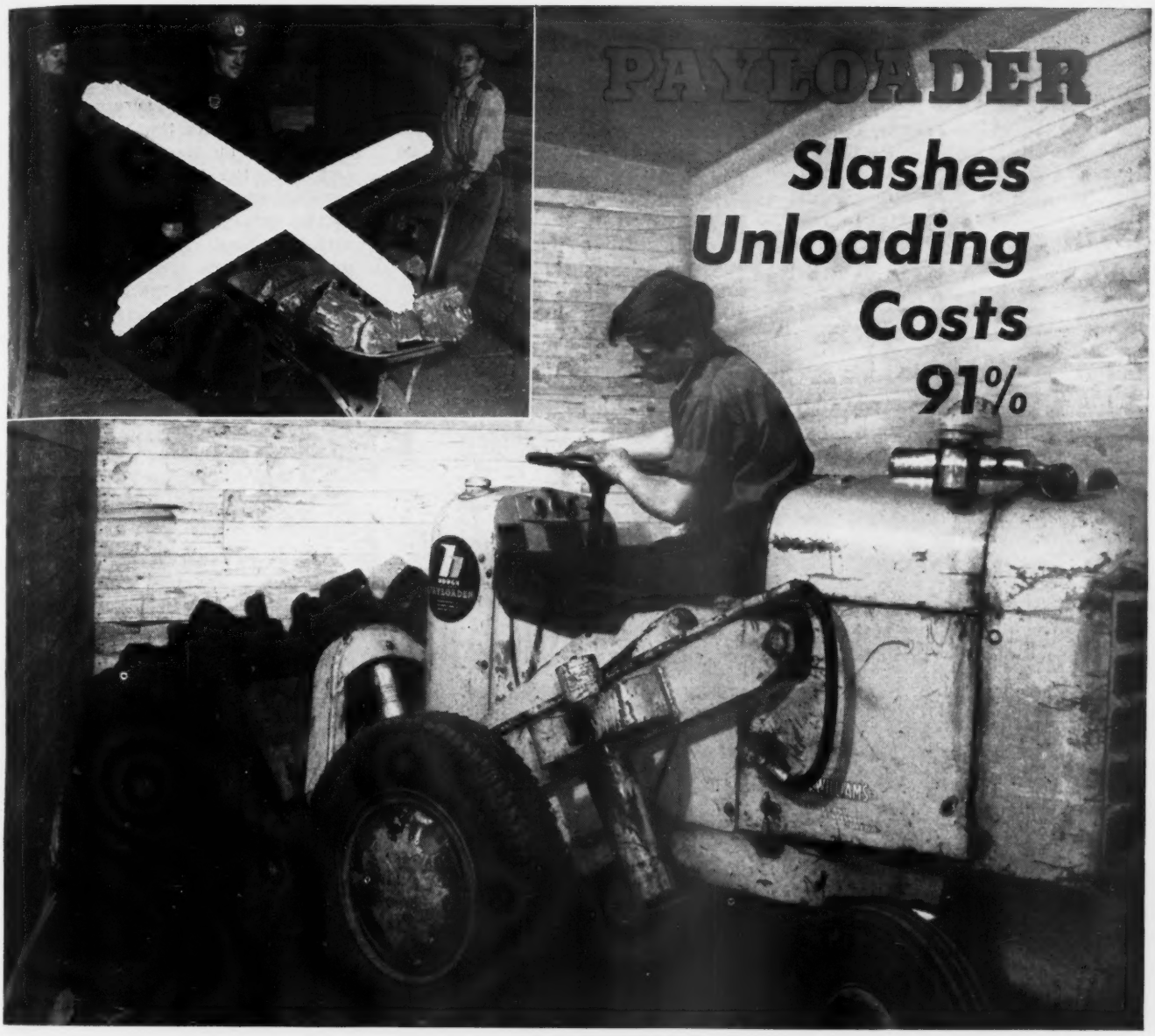

* A complete report on Timken's use of "PAYLOADERS" for bulk material handling is found in Vol. 1, No. 3 of INDUSTRIAL HANDLING. Copy of this is available for the writing. Literature on any of the "PAYLOADER" models is also available, without obligation: the 12 cu. ft. Model HA, the 15 cu. ft. Model HAH, the ½ yd. HE, the ¾ yd. HF, the 1¼ yd. HY or the big 4-wheel drive Model HM.

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This distinctive tractor-shovel is completely Hough-built *expressly for tractor-shovel work,* with superior features that insure more production and satisfaction — such advantages as several speeds in BOTH directions, and large pneumatic tires that work on ground or floors. If *you* have bulk material handling problems "PAYLOADERS" can probably help you solve them. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Illinois.

SAY "HUFF"

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(*Continued from page* 212)

this method, the steel should be poured hot and slowly, so that there is a large temperature gradient between the first metal poured, which naturally is at the points farthest from the gate, and the hotter steel close to the head. When that is the case, directional solidification is attained, and the contraction of the parts of the casting first poured is fed by the adjacent hotter steel, and that of the last portion to freeze by the fluid metal in the head. If the casting is so shaped that it is thinner at the points farthest from the gate, and grows thicker near the head, still better directional solidification is secured. A casting like the anchor shank illustrated in Figs. 12 and 16 (December, 1951) but of smaller size, is ideally suited to be made solid by an atmospheric pressure head attached to its heavy end. As mentioned in describing the production of that casting by the partial reversal method, atmospheric pressure heads attached at the bottom of a casting now are used often in preference to the more difficult method of tipping up the molds after pouring.

Like the partial reversal method, the practice just described has the advantage that it permits bottom pouring, yet puts the hottest metal, surrounded by the hottest sand, in and near the head. It thus has a marked advantage over the use of bottom gating in connection with top-attached heads, since that method puts the coldest metal in the heads, and the hottest at the bottom of the mold. Because the gate admits the steel into the head, instead of directly into the mold cavity, there is also less cutting of the mold sand when the bottom attached head is used. In most cases, too, blind heads of this sort can be cut off more readily and cheaply than open risers of the usual type attached at the top of the casting.

Has Several Disadvantages

Offsetting these advantages is the fact that side attached heads call for a larger flask than is required for top attached ones. Dirt washed into the mold, too, has no way of escaping when there are no heads at the top of the casting, and hence is more apt to be trapped in the mold cavity. Perhaps the worst disadvantage of the method, however, is that when undried green sand is used, the steel that first enters the mold takes up a great deal of gas due to the evolution of water vapor from the sand, and releases it again in solidifying. There will then be a great many gas holes in the parts of the casting farthest from the gate and head, while the last metal that enters the mold, coming in contact with sand dried by the first-poured steel, absorbs no gas and sets perfectly solid. When the first metal to enter the mold is run off into top-attached heads, the casting will be sound throughout. To take care of this condition, when using bottom-attached atmospheric pressure heads, it is often necessary to mold small flow-offs at the far end of the piece, through which the first-poured metal may escape. This difficulty is encountered particularly in pouring some of the heat and corrosion resisting alloy steels containing high percentages of chromium and nickel.

Side or end attached heads of the type just described are used chiefly for small and medium-sized castings, such for instance as that shown in Fig. 2 (November, 1951) in the section desecribing gating practice; the method is not well suited to the production of large or heavy pieces.

Spot Heads and Continuous Heads

—Top attached heads may be applied

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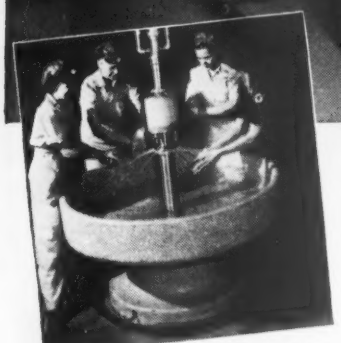

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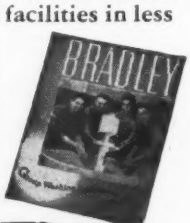

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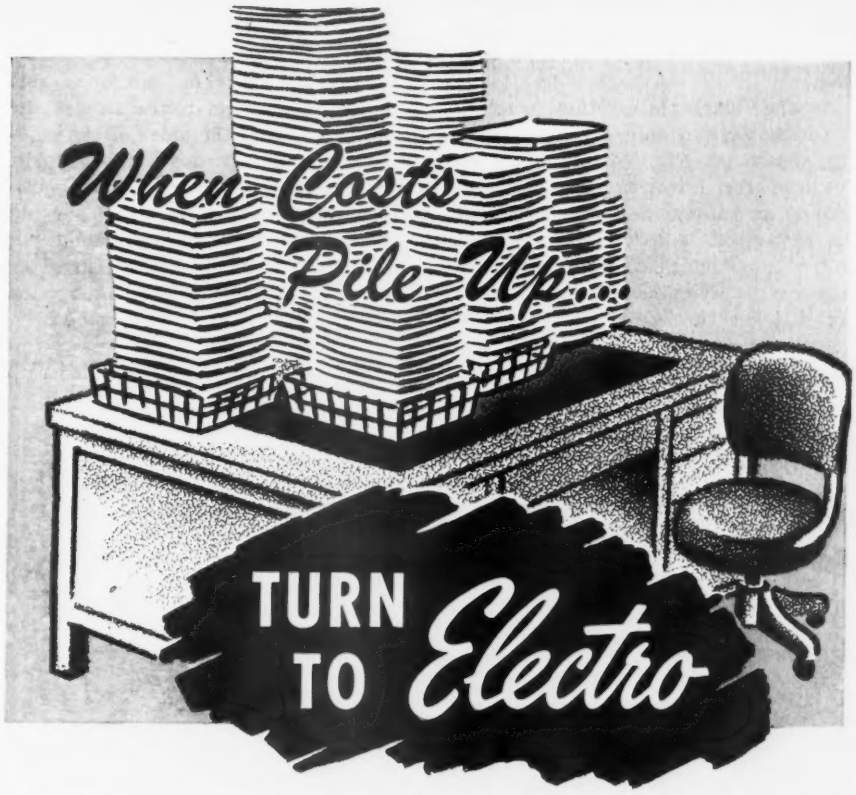
at a number of points on the upper portion of the casting, and are then known as "spot" heads, or they may cover the entire top surface. In making a wheel with a heavy hub, for instance, a number of separate heads are usually placed at intervals along the rim, and the hub is fed by one or two spot heads. When the hub is very heavy, however, it is usually better to cover its entire surface with a single large head. On spoke wheels, the spot heads on the rim are often placed at the junctions of the spokes and the rim, because the extra thickness of metal at those points forms hot spots that will stay liquid longer than the rest of the rim and therefore will be hollow if not fed by a riser. If there is a heavy section at one side, such as the counterbalance of locomotive drive wheel centers, an extra large spot head is set at this point.

A spot head will feed the freezing contraction of the steel only in the area immediately below it, or at least in a space not greatly larger than the head. This fact leads the producers of locomotive drive wheel centers, which are extensively machined and must be thoroughly sound, to use a single head covering the entire hub, instead of one or two spot heads set to one side of the center core. Similarly, the head set on the counterbalance is usually big enough to cover a large proportion of the area to be fed. The spot heads on the rim, too, are placed fairly close together, so as to leave the smallest possible unfed areas between them.

Heads Take up Dirt

A secondary function of top-attached heads, in addition to that of feeding the freezing contraction of the sections beneath them, is to serve as avenues of escape for loose sand or slag floating on the surface of the steel. Spot heads serve this purpose to only a limited extent, because the dirt is trapped against the flat cope surfaces between them, to appear as sand spots when the casting is machined. When it is essential that no sand become trapped in this way, instead of placing spot heads upon it, the entire cope surface of the casting should be covered by integral heads.

As was mentioned in the March, 1949 issue on page 97 on methods of molding, large gear blanks for marine steam turbine drives are made with annular heads that simply carry the entire outline of the rim, somewhat thickened, up to the top of the cope sand. Because the rims of these castings must be absolutely clean, and no sand spots whatever can be



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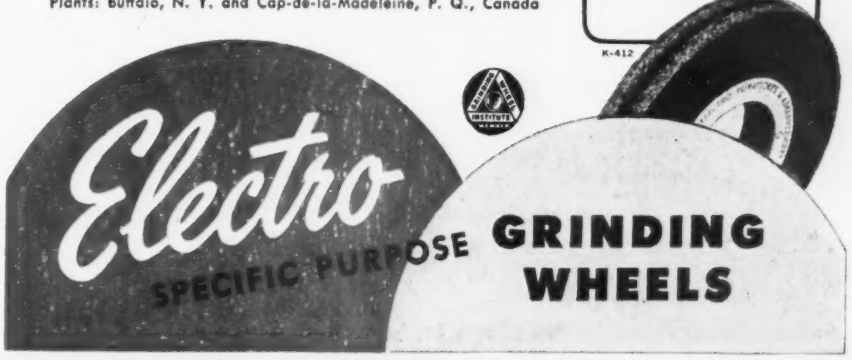

tolerated, it is necessary to mold them with these full annular heads that carry off all floating sand and slag.

Another example of this practice is the large hydraulic cylinder casting shown in Fig. 34, page 77, of FOUNDRY for January, 1949. On this casting an annular head, thicker than the casting it is to feed, covers the entire top surface. Such heads not only carry off almost all the floating dirt on the steel, but feed the solidification contraction of the entire piece to an equal degree.

Steam turbine casings, formerly made convex side up with spot heads set on them at a number of places, are today always molded open side up, and the heads cover almost the entire outline of the sides of the casting. Openings through these large heads are, for the most part, provided simply as a means of carrying the cope bars from the outside of the flask to the inner area, in order to support the sand in that portion of the cope. Fig. 15 (December, 1951), from the article by Duma and Brinson already referred to, illustrate this practice in a Navy Yard shop.

The yield of good castings per unit of steel in the ladle is far lower when these large integral heads are used than with separate spot heads. Sometimes, however, the molding cost may be lower with integral than with spot heads. Spoked gear blanks in which the annular head is formed between a central core and a cheek, and no cope need be made, are a case in point.

Proportioning Risers—In determining the correct thickness and height of heads to use on castings of varying size and shape, the foundryman until recently had no definite rules to guide him, and was obliged to rely entirely upon experience. The heads were almost always made a little thicker than the sections of the casting upon which they were set, and the rule-of-thumb standard, followed for many years, was to make the height of cylindrical heads one and a half times their diameter. If the head was of rectangular cross-section, the height was one and a half times the average of its width and thickness.

The depth of the available cope flasks usually makes it difficult to have the height-thickness ratio the same for a number of different sized heads on a single casting, the ratio being lower for the larger heads unless they are built up by means of cores or extra flask sections set on top of the cope. When this is done, pouring must be stopped when the shorter heads are full, and resumed when they have frozen over. Since pipe eliminator cannot be used on the shorter heads, they feed less efficiently than the high ones that can be kept open. Usually, however, when heads of different diameters are used on a single casting, the depth of the cope will determine the height of all the heads, and that of the smaller ones will be greater than necessary. Sometimes the cope depth is such that all the heads will be more than one and a half times as high as they are thick, unless pouring is stopped before they are completely filled. To keep the height of the heads to the desired figure, "stop-pour" marks such as rods or large nails may be driven into the sand as a guide for the men handling the ladle. Too often, however, pouring gangs fail to notice the markers, and follow the usual practice of filling the heads up level with the top of the copes.

Top open heads are usually made a good deal higher than is really necessary, and often their diameter also is too great. As the dimensions of

(*Continued on page* 218)

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LIFTING and transporting these two huge steel castings (each weighing 4000 pounds), is everyday work for this STEARNS Lifting Magnet at the Maynard Electric Steel Casting Co., Milwaukee. This 45" diameter circular magnet is one of a team of STEARNS Lifting Magnets used throughout the cleaning room and foundry whenever castings have to be moved — doing the job efficiently and economically year in and year out.

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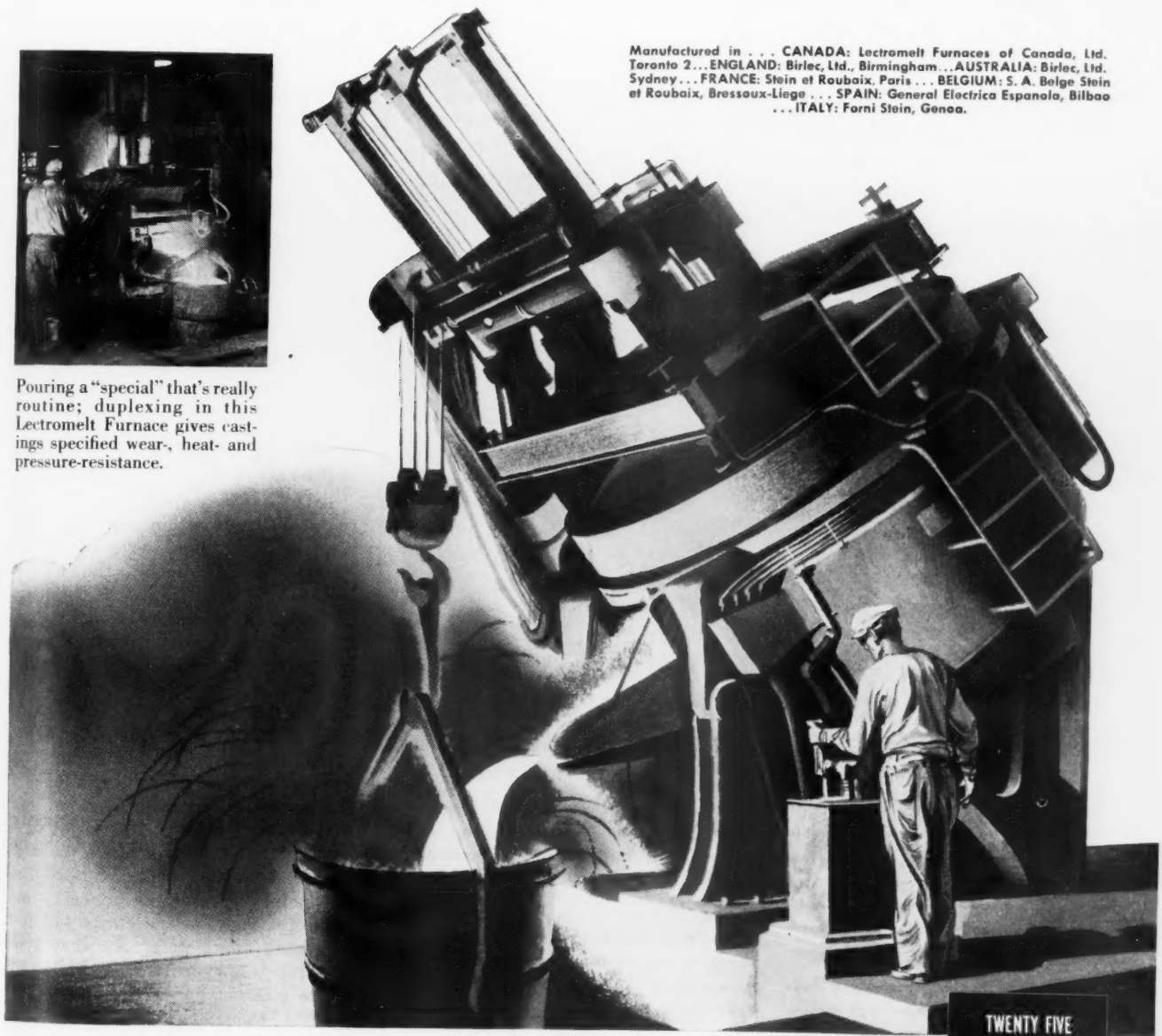

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MOORE RAPID

WHEN YOU MELT... *Lectromelt*

(*Continued from page* 216)

blind heads attached at the bottom of the casting are unaffected by the depth of the flasks used, these heads usually vary from theoretically correct proportions much less than do open ones.

Recently a method has been proposed for figuring the smallest sizes of head that will successfully feed castings of different weights and dimensions. In the *Transactions* of the American Foundrymen's Society, J. B. Caine[20] has described this method and explained the theoretical considerations upon which it is based. Mr. Caine's work was developed from that of Chworinoff[21], but the validity of his proposed method is not affected[22] by the fact that Chworinoff's conclusions appear to be too broad to conform completely to known facts.

Chworinoff showed that the time required for a casting to solidify is proportional to what he calls its "size coefficient," or the relation of its volume to its surface area. (His actual figures are strictly true only when the metal is in contact with a body of sand of such thickness that the sand will not be saturated with heat until the steel has completely solidified, which of course is seldom if ever the case in foundry practice). Caine uses a new term, the "freezing ratio," which is the reciprocal of the size coefficient of a casting and that of a riser set upon it, or

$$\frac{\text{Surface Area of Casting}}{\text{Volume of Casting}} \Big/ \frac{\text{Surface Area of Riser}}{\text{Volume of Riser}}$$

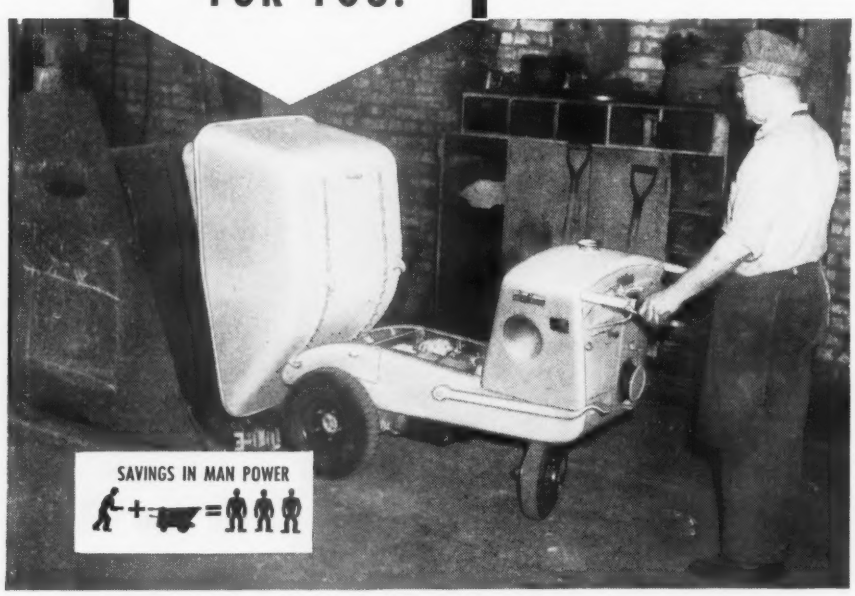
If the size of coefficient of a casting and that of its riser are equal, the freezing ratio is unity—in other words, casting and riser will solidify at the same rate. Under these conditions, the riser would have to be infinitely large in relation to the casting, if it were to contain enough metal to feed the freezing shrinkage of the casting. The ratio of the volume of the riser as poured to that of the casting, Caine calls the "volume ratio," expressed as: Volume of Riser as Poured ÷ Volume of Casting. As the freezing ratio approaches unity, then, the volume ratio will approach infinity. Conversely, as the freezing ratio approaches infinity, the volume ratio approaches the amount of solidification contraction of the casting.

This is necessarily true, since if the riser froze at an infinitely slow rate, it would have to contain only enough metal to equal the loss of volume of the casting as it solidified, in order to produce a solid casting. From this relation, Caine shows mathematically that if the freezing ratios of various risers and castings are plotted against their volume ratios, the result is the curve *A* in Fig. 27, in the shape of a portion of an hyperbola. This curve is the locus of the points representing heads of such dimensions relative to those of a casting that they will make the casting solid. A head of such size that the point representing it lies above or to the right of the curve will feed a casting completely; one that gives a point below or to the left of the curve will not do so. This curve represents the conditions that obtain when both casting and riser are in contact only with sand.

If all the riser surface is not in contact with sand and is not dissipating heat into the mold at the same rate as the casting, this variable must be taken into consideration. When an efficient pipe eliminator is used on the riser, for instance, the

PRIME-MOVER SPEEDS PRODUCTION FOR YOU!

Operator has positioned the powered Prime-Mover at Wheelabrator hopper without pushing or pulling. Foot pressure on pedal dumps bucket which then returns to load position automatically.



PRIME-MOVER speeds production for you!

It is good fortune when a single piece of equipment performs so many jobs well—as prime-Mover does in a foundry. This fact has placed foundries at the top of our list among satisfied Prime-Mover owners. Foundry men say that Prime-Mover returns the investment within 60 days.

The ten cu. ft. bucket handles all kinds of bulk materials—castings—sand—coke—coal—scrap—knockout. The platform handles heavy flasks, cores, and large castings.

Dependable 5 H.P. air-cooled Wisconsin engine powers the Prime-Mover forward and reverse. Protected from foundry dust and dirt. Runs all day on a tankful of gasoline.

Prime-Mover supplies the capacity and the power to save the time and the wages of three men—often more. Anyway you add it up—Prime-Mover multiplies manpower. Your request for additional helpful data will be promptly filled.

THE PRIME-MOVER CO., Muscatine, Iowa

THE Bell PRIME-MOVER

relatively slower freezing rate of the riser as compared to that of one in contact only with sand, will shift the curve to the left[23], into the position *B* in Fig. 27. This curve represents the conditions that would exist if pipe eliminators of the usual type were used. If highly exothermic (modified thermit) material were employed, the curve would be shifted to a much greater extent. Obviously, as Caine says, "Pipe eliminators are quite useful in increasing riser efficiency for steel with castings of low surface area, resulting in freezing ratios below about 1.40. If the freezing ratio of the casting-riser combination is below 1.10, the use of an efficient pipe eliminator is imperative". On the other hand, if the riser has a large surface area exposed to the air and dissipates heat at a higher rate than one in contact only with sand, the curve will be shifted somewhat to the right.

Use Other Methods

Strictly speaking, the calculations apply only to castings of such sizes and shapes that they can be made sound with but one riser, and the riser is considered to have functioned perfectly if the portion of the casting immediately adjacent to it is solid. Shrinkage cavities at points remote from the riser, due to inequalities of section shapes and sizes, cannot be fed from a riser of any sort, and their prevention is an entirely different matter, requiring padding, chilling, supplementary risers, etc. Center-line shrinkage in thin sections, also, cannot be prevented by normal risering, as discussed elsewhere.

In figuring freezing ratios, allowance has to be made for the area of the surface of casting and riser common to both—that is, the area of their plane of intersection, which is subtracted from the surface areas of both the riser and the casting. Cores surrounded on more than one side by metal, re-entrant angles, and changes in section all restrict the flow of heat into the sand of the mold, and the surface of the casting at these locations cannot be included in the surface area of the casting at its full value. Much has already been done toward determining the proper factors to use in making allowance for these variations from plain outline.

These theoretically derived curves have been checked by a joint research participated in by a number of steel foundries, who made a great many test castings of relatively simple shape with risers of various sizes, and determined the ratios that would produce sound castings. The results of this elaborate set of experiments are given in *Research Report* No. 13 of the Steel Founders' Society of America, entitled "Determination of the Factors Influencing Riser Efficiency." The curves calculated from these empirical tests conform so closely to curves *A* and *B* of Fig. 28 that it is not really worth while to include them in the figure.

In using the charts, a riser of given size, always with a cross-sectional area in excess of 1.15 per cent of that of the portion of the casting upon which it is set, is selected by what Mr. Locke, in discussion of Caine's paper, calls the "hunt and try system", and the freezing ratio and volume ratio for this riser and any given casting are calculated. If the point so determined falls above or to the right of the curve, the casting will be sound. If it is too far from the curve, the calculation is repeated for a smaller riser until one is found whose locus lies fairly close to the curve. If the point lies below or to the left of the curve, of course, the calculation is repeated

Want core plates that SAVE MONEY?

. . . then use TRANSITE CORE PLATES

for easy handling, low maintenance, long life!

You get real long term economy with Transite* Core Plates. Their initial cost is low . . . and their maintenance cost negligible. Transite Core Plates are tough and corrosion-resistant. They are made from an asbestos and cement composition by a special Johns-Manville process. They resist shock and corrosion . . . will not crack or break easily.

Here are other important reasons for using Transite Core Plates:

THEY SPEED PRODUCTION—
Transite Core Plates are easily handled. They're simple to clean, too, since core wash, sand, etc. do not adhere to them as readily as to other core plate materials.

THEY MAINTAIN ACCURACY—
Foundrymen who have used Transite Core Plates for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 290, New York 16, New York.

*Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES
Made of Asbestos

using a larger riser.

(To be continued next month)

References

19. J. Williams, "Means for Casting Metals," U. S. Patent 2,205,327.-Jan. 18, 1940.
20. J. B. Caine, "A Theoretical Approach to the Problems of Dimensioning Risers," *Transactions*, American Foundrymen's Society, Vol. 56, 1948, page 492.
21. N. Chworinoff, "Theory of the Solidification of Castings," *Giesserei*, Vol. 27, 1940, page 177. British Iron & Steel Institute *Translation* No. 117.
22. H. A. Schwartz and Victor Paschkis, Discussion of Caine's paper, *Transactions*, American Foundrymen's Society, Vol. 56, 1948, pages 498, 500.
23. The two curves in Fig. 27 are shown as the solid line portions of Figs. 2 and 3 of Caine's paper.

Recommends Pipe Fittings Packaging Standard

A proposed simplified practice recommendation for the packaging of standard malleable iron screwed pipe fitting, black or galvanized, 150-lb steam working pressure for 2-in. pipe size and under, has been submitted to manufacturers, distributors, users, and others interested, for acceptance or comment, by the Commodity Standards Division, Office of Industry and Commerce, U. S. Department of Commerce.

Purpose of the recommendation is to establish a simplified schedule of standard quantities per unit package. Copies may be obtained upon request to the division, Washington 25.

Material Handlers Pick New Officers

Material Handling Institute Inc. elected L. West Shea, Union Metal Mfg. Co., Canton, O., president at its annual meeting in New York, Dec. 12. Elected with Mr. Shea to the posts of first and second vice president, respectively, were John C. Mevius, American Engineering Co., Philadelphia, and H. M. Palmer, Lewis-Shepard Products Inc., Watertown, Mass. Mr. Mevius is active in planning the institute-sponsored National Materials Handling Expositon slated for Philadelphia in May, 1953.

L. W. SHEA

Mr. Shea stated that in 1952 the Materials Handling Exposition slated tempt to co-ordinate services now performed by the eight specialist associations which are subdivisions of the industry; eliminate duplicate effort between the overall group and the vertical associations; continue service with and for the National Production Authority; inaugurate an industry service plan to help industrial management to save cost, time and waste through better in-plant logistics, and increase educational efforts of the American Material Handling Society.

Book Review

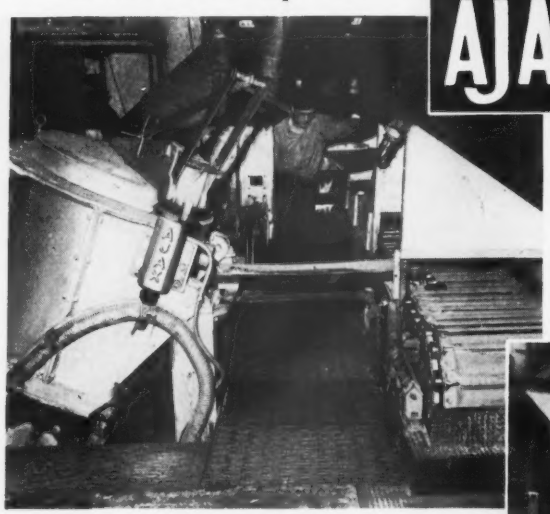
Cast and Molded Dies, copyrighted by International Textbook Co. and published by Laurel Publishers, Scranton, Pa., paper, 68 pages, 4¾ x 7½ in. Price $1.

This is one of a series of 17 pamphlets on aircraft fabrication. In the section on metal dies, the following information is presented: Design characteristics of dies, patterns, and cast dies. Discussion of nonmetallic dies covers concrete and plaster dies, and plastic dies and forms. The complete series of books covers properties of materials, basic problems of airplane manufacturing, tooling, and methods of construction. Numerous illustrations help explain the principles involved.

MILLIONS OF POUNDS

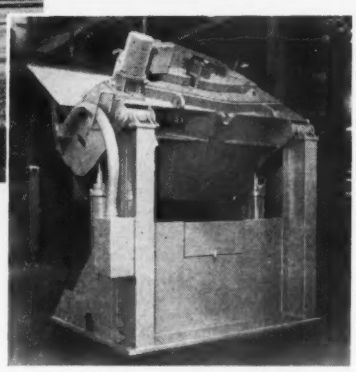
of Aluminum per year reclaimed with the help of

AJAX INDUCTION FURNACES



166 kW AJAX Induction Furnace in tilted position, pouring molten aluminum alloy through a coated trough into ingot molds on conveyor.

Major Auto Manufacturer recovers scrap from machining operation by modern melting process



Above is a 330 kW furnace. AJAX Engineering Corporation manufactures low frequency electric induction furnaces in a great variety of sizes ranging from 20 to 1000 kW. This type of equipment has been adapted to the full range of nonferrous metals and alloys.

Here is an interesting setup for reclaiming aluminum alloy chips, which is installed adjacent to the piston casting setup in one of the largest automobile manufacturing plants in the country. More than half of the aluminum needed for pistons in this plant comes from this scrap recovery program. A considerable net profit is realized, and aluminum purchases are lowered.

Send for Reprint of Article on Scrap Recovery by Induction Furnaces

AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

Two of five!

Detroit ROCKING Electric Furnaces build long service record—melting bronze for the Jeffrey Company foundry

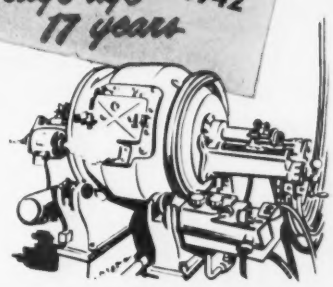
At The Jeffrey Manufacturing Company, Columbus, five Detroit Electric Furnaces have made excellent records melting bronze for worm wheels, bearings, bushings, electrical contacts, and pressure-type castings. In hundreds of other foundries, Detroit Furnaces are doing equally outstanding jobs melting bronze, iron, and steel alloys.

Detroit Rocking Electric Furnaces turn out fast melts of uniform high quality metal. Close control of analysis produces metal of desired analysis time after time, with optimum use of power. The melts are homogeneous, thoroughly mixed by the rocking action of the furnace. Electrodes are free of the molten metal at all times, reducing carbon pick-up to an absolute minimum.

Long life of Detroit Electric Furnaces is documented by such installations as that shown. Economies are proven, too—accomplished by full use of power, less heat loss, reduced metal shrinkage, more heats per day, less metal waste per melt, and reduced out-of-production time because of longer refractory wear and easy shell replacement.

Detroit Rocking Electric Furnaces are tailored to your operating needs. Capacities from 10 to 4000 pounds, for ferrous and non-ferrous melting.

1 350 lb. furnace installed 1925
1 350 lb. furnace installed 1925
1 350 lb. furnace installed 1937
1 700 lb. furnace installed 1941
1 700 lb. furnace installed
average age 1942
17 years



Better melts, faster melts—rocking action does it! Get the facts on what Detroit Rocking Electric Furnaces can do for you! Send us your data now!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrios, "Eisa" Ltd., Sao Paulo. CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y., MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F. EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

MEMBER FEMA

New EQUIPMENT *and Supplies*

For Additional Information on These Items Use Reply Card—Page 225

(1)—Magnetic Pulleys: Homer Mfg. Co., Dept. 156, Lima, O.— Permanent magnetic pulleys are available for standard or heavy duty service in diameters of 12, 15, 18, and 20 in., with belt widths ranging from 4 to 60 in. In addition, permanent pulleys are available for light, standard, or heavy duty service in diameters of 24 and 30 in., with belt widths ranging from 20 to 60 in. Larger size pulleys for special application are available upon order. Pulleys are made of Alnico magnet material, and the heavy duty types are said to equal or exceed the power and efficiency of electro-magnetic pulleys of the same size.

For More Details Circle No. 1—Page 225

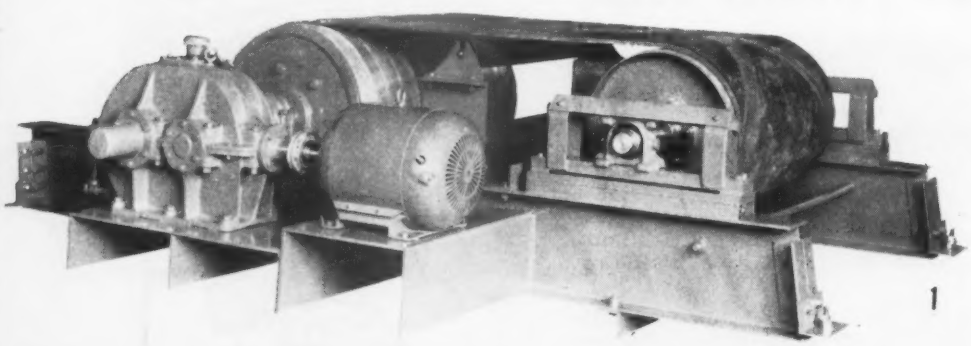
(2)—Cutting Tool: Composite Die Supply Co., Dept. 125, 14310 Birwood, Detroit 4—High-speed portable milling machine, planer, router combination cutting tool may be used on wood, plywood, plastic, Masonite, stone, paper, fabric, and nonferrous metals and alloys. Machine is designed to follow concave and convex curves and at the same time can be moved upward or downward to cut in two directions. Furnished with one cutting head and two adjustable cutting blades, the new tool has a 60-cycle, 115-v, and dc, 18,000 rpm motor with 12-ft extension cord, screwdriver, blade, and head wrenches.

For More Details Circle No. 2—Page 225

(3)—Hardness Tester: Metallurgical Instrument Co., 2454 West 38th St., Chicago 32—Universal optical hardness tester, manufactured by Officine Galileo, Italy, is designed for Rockwell A through F scales and brinell hardness test, and can be adapted to special tests and Vickers measurements. Tester uses a lever arm supported on knife edges and projects a magnified image of the hardness reading on a screen. Loads are interchanged automatically by a device controlled by an external knob. All loads are obtained by weights which insure constancy of calibration. A built-in oil damper regulates the speed with which load is applied. An external screw adjusts the speed. Vickers measurements at 30 kg may be taken by using a pyramid diamond penetrator and a special microscope to read the diagonals of the Vickers impression. Included as standard equipment are two test specimens, four anvils, and two steel ball penetrators.

For More Details Circle No. 3—Page 225

(4)—Heat Machine: Fageol Heat Machine Co., 5725 Mt. Elliott Ave., Detroit 11—Heat machine of 140,000 Btu capacity for indoor or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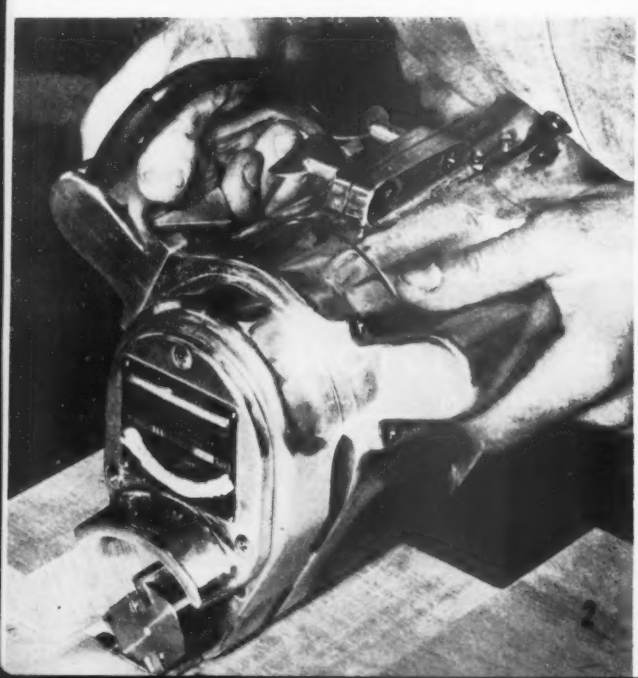
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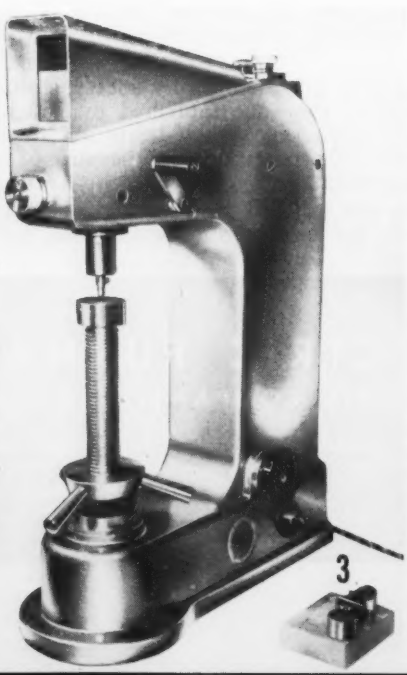
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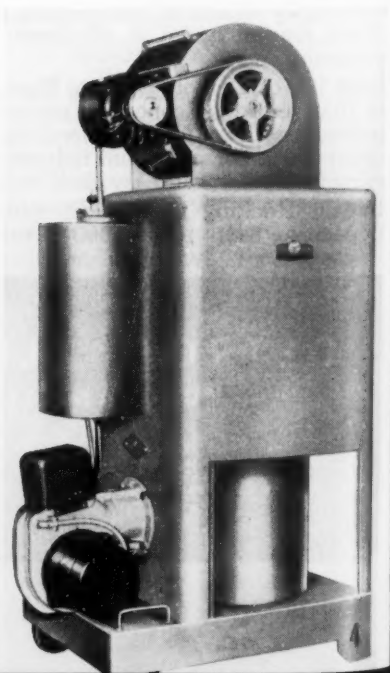
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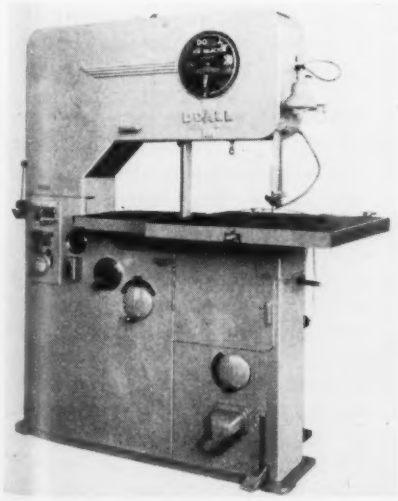
outdoor use employs a new principle of forced air circulation. By blowing warm air out of the machine's base along the floor, it creates a 6-ft high heat blanket to keep workers warm. Because it sprays heat from all sides across the floor, it can be located in the center of large areas. It is designed to heat up to 3000 sq ft of confined space or 1600 sq ft of open space. A 200,000 Btu model also is available. Heat machine burns fuel oil of No. 3 or lighter grades or kerosene. It requires no flue or chimney. Self contained, it has an attached 6-gal fuel tank and is equipped with wheels for easy portability. The machine can be started or stopped by snapping a switch.

For More Details Circle No. 4—Page 225

Weight Rule: Warren - Knight Co., 136 North Twelfth St., Philadelphia 7—Weight slide rule, constructed with a metal base and plastic face with one slide and a cursor, is designed for determining the correct weight of any size or shape of lead, copper, brass, steel, cast iron, aluminum, or magnesium. On the back face of the rule is a new arrangement of standard slide rule scales, making the rule an all-purpose tool. Instruction manuals are furnished for using both faces.

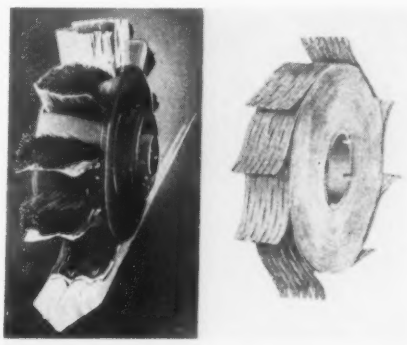
For More Details Circle No. 5—Page 225

Band Machine: DoAll Co., 254 North Laurel Ave., Des Plaines Ill.—General purpose contour sawing machine takes continuous saw, file or abrasive bands up to ½-in. wide. It features a 3-speed transmission and controllable drive providing variable tool velocity ranging from 25 to 6000 fpm. It has 36-in. throat capacity and normally carries the saw band over three wheels, but when the band becomes too short after several welds, the band may be used to its full life over two wheels on work requiring no more than a 16-in. throat. Machine has built-in blade welders with squaring shear, motorized grinder and thickness gage, assorted band tools and guides, automatic power feed, job selector dials, speed indicator, dust spout, adjustable light and chip blower. Its variable tool speed and variable feed pressure are controlled and correlated by handwheels convenient to the operator.



For More Details Circle No. 6—Page 225

Abrasives: Merit Products Inc., 4023 Irving Pl., Culver City, Calif.—New abrasive cloth refill cartridges for use on the company's brush-backed contour sanders are said to add flexibility to the already triple-flexed action. Illustration on the right shows the cloth cut in staggered rows to give it pliability. Illustration at left shows how the new abrasive gets down into grooves and recesses with a "paint brush" action. Refill cartridges are made up of several strips of abrasive wound around a central core and may be loaded in less than a minute, it is claimed.



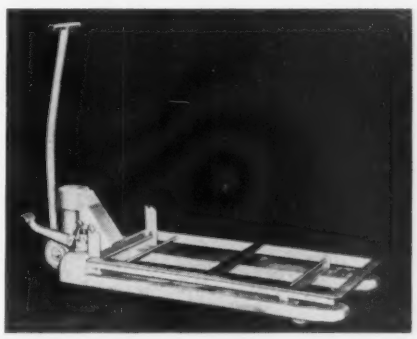
Cartridges are available in garnet and aluminum oxide cloth in a wide range of grits.

For More Details Circle No. 7—Page 225

Safety Sign: Industrial Products Co., 2827 North Fourth St., Philadelphia 33—Safety record sign, designed to act as a constant reminder of days worked without a lost time injury, conveys the thought that responsibility rests with each employee. It is 20 in. wide and 30 in. high, attractively finished with green background and white letters. It features two blackboard finish panels enclosing the word "DAYS" for present and previous records of days without a lost time injury. Records are kept up to date by marking in with chalk. Sign is of 20-gage metal, finished in baked dulux, and suitable for indoor and outdoor use.

For More Details Circle No. 8—Page 225

Skid Adapter: Raymond Corp., 6585 Madison St., Greene, N. Y.—Skid adapter is designed to enable conventional hand pallet trucks to lift and handle skid platforms. Most conventional pallets are low with boards at both top and bottom and require a truck with lowered height of 3¼-in. Skid platforms usually are higher, have no bottom boards and



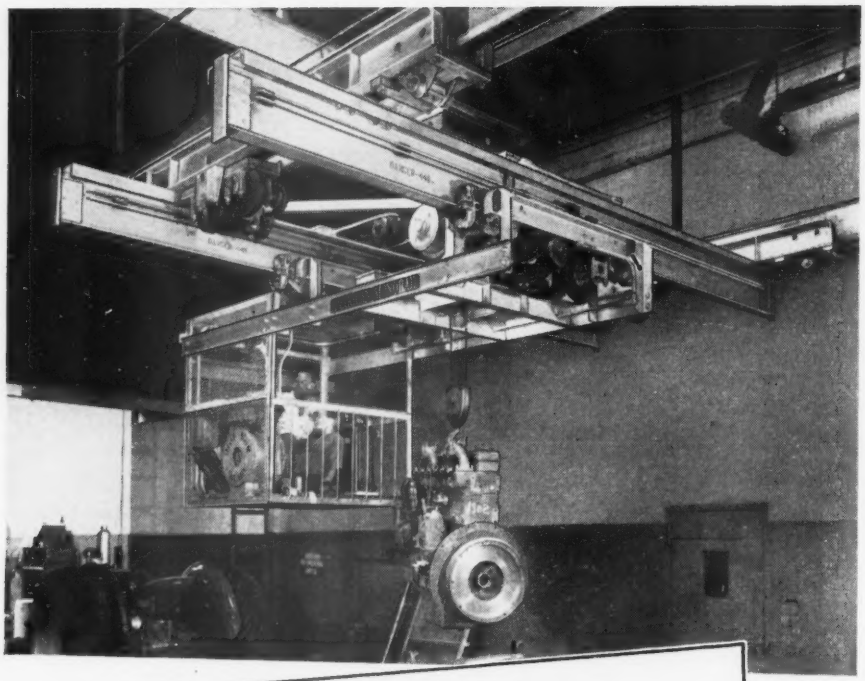
require the use of a platform truck having a 6-in. or more lowered height. The adapter, which is a hinged superstructure that can be raised out of the way when handling pallets or lowered into position when handling skid platforms, enables a single truck to be used for handling both types of equipment.

For More Details Circle No. 9—Page 225

Magnetic Control: Electric Machinery Mfg. Co., 821 Second Ave. S. E., Minneapolis 14—Magnetic amplifier control is designed for use with an adjustable speed magnetic drive, an electromagnetic torque transmitting device which gives variable speed output when used in combination with a constant speed motor. The magnetic amplifier control is a saturable core reactor amplifier system using nonmoving parts to accomplish stepless control of speed to within ±0.5 per cent of speed called for. This sensitivity is obtained through a current amplification ratio of approximately 20,000 to 1. Adjustable-speed magnetic drives are built in ratings of 25 hp and higher in the usual motor speeds.

For More Details Circle No. 10—Page 225

Furnace Arches: Geo. P. Reintjes Co., 2517 Jefferson St., Kansas City 6, Mo.—Through use of adjustable refractory hanger rods and beams, open hearths or practically any other furnace where suspended fan-tail nosing and chill walls meet, can be constructed of alumina, silica, or metal-clad basic refractories without using special tile shapes, it is claimed. By using this method of fairing arch construction, tiles can be supported singly or in pairs at the elevation desired to provide a maximum burning depth for each tile. Thus, it is said, the same tiles and castings can be used for all furnaces even though roof contours are different. After the corners of the rec-



here's the crane for . . .

CONSTANT SERVICE at HIGH SPEED

If your handling operations must be "on the go—all the time—and fast" then investigate this American MonoRail Crane. With constant service at high speed, it offers the advantages of rugged construction, low-cost operation and quick installation.

The big reason is articulated trolleys. Each trolley wheel carries its share of the load in perfect alignment with the craneway tracks. All possible friction is eliminated. The result is perfectly articulated trolley travel. Articulated trolleys permit operating speeds of 500 feet per minute under constant service.

SEND FOR BULLETIN C-1

THE AMERICAN MONORAIL COMPANY

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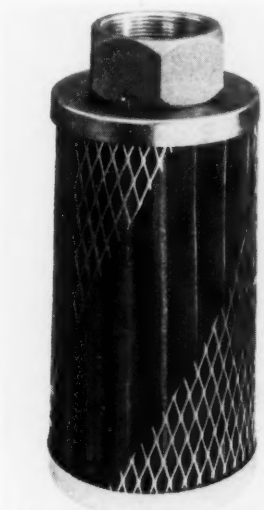
tangular tiles have eroded, a true fairing arch is formed with no obstructions to gas flow. The "U"-shaped beams can be suspended from overhead girders in a cantilevered position if necessary. Refractory-supporting hangers are bolted to these beams. As much as 6 in. of adjustment can be obtained without changing bolt length. By using standard tiles which come in lengths of 12, 13½, 15, and 18 in., the fairing arch can be formed to give uniform maximum effective burning of the refractory.

For More Details Circle No. 12—Page 225

Filters: Marvel Engineering Co., 625 West Jackson Blvd., Chicago 6—Two new high-flow-rate liquid filters (75 and 100 gpm models) have been added to the company's line, which also includes 5, 8, 10, 20 and 50 gpm



models. All are available in line and sump types with mesh sizes from 30 to 200. The 75 gpm filter is 12½-in. overall including coupling nut and 6 in. in diam. Coupling nut fits a 2½-in. pipe. The 100 gpm model measures 14 in. by 6½-in. in diam. The filters are permanent, cleanable types with sufficient room for foreign matter accumulation to obviate too-frequent cleaning.

For More Details Circle No. 11—Page 225

Ignition System: Burdett Mfg. Co., 3433 West Madison St., Chicago 24—Newly developed system for igniting radiant heat burners is said to assure safety during the operation. Burners, arranged in series upon a gas supply manifold, are ignited at one end by an electric spark when a manual push button is depressed. The closed circuit also energizes the automatic gas supply valve at the same instant, permitting gas to reach all of the burners. A flame supervising device is located at the last bur-

(*Continued on page* 228)

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Better Sand Handling

Pettibone Mulliken Corp., Beardsley & Piper Div.—Mull this over: here is a 4-page, well-illustrated folder that tells of better methods of sand mulling, ramming molds and cores and sand conditioning with Beardsley & Piper equipment. Better latch on to this folder—it may mean money in your coffers.

51. Give 'Em the Air

Worthington Pump & Machinery Corp.—Savings resulting from installation and operation of type YC motor-driven direct-connected and belted Feather Valve compressors are cited in 8-page bulletin L-667-B1B. Sectional views show features of these two-stage machines with displacements up to 1351 cfm at 80 to 125 psi pressures.

52. Warm Air Heaters

Dravo Corp.—Rosie the Riveter or Fanny the Founder will be warm and contented when working in buildings heated by Counterflo direct-fired, warm air heaters. Described in this nice 8-page bulletin 526, heaters are used in many plants. And why they have gained high industrial acceptance is detailed.

53. Strong, Hard Cores

General Electric Co., Chemical Dept. — Increased production, short baking cycles, reduced costs and improved quality are obtainable advantages reported for phenolic resin core binders in 12-page treatise "Phenolic Resins for Foundry Use." Charts prove performance of resin binder.

54. Charging Techniques

Whiting Corp.—"Tips on Improving Cupola Charging!" is a 6-page illustrated folder which deals with modern practices. Mechanical charging offers one way to release manpower from a dirty, tedious job for other productive work.

55. Power Handler

Kwik-Mix Co.—Get the bugs out of foundry operations with the versatile Moto-Bug. Details of this ½-ton capacity, gasoline engine powered materials handling truck are detailed in 2-page data sheet KM-315. Choice of interchangeable flatbed platform, 10-cu ft hopper, ½-ton power fork lift and 5 scraper blade adapt it for hundreds of uses.

56. Ductile Iron Reading

International Nickel Co.—Twelve (12) publications on properties, characteristics and features of ductile cast iron are listed in 4-page folder. It summarizes all the articles, lists applications and contains order blank and space for you to submit details of your problem to company for answer. A real service.

57. Feeder-Conveyor

Link-Belt Co.—You will be making a mistake if you turn the page without marking the coupon to receive this be-yoo-ti-ful 16-page book No. 2244 on Positive Action oscillating feeder-conveyors. You will get detailed description, photographs of various types, details of design and all the specs. And for free.

58. The Die Is Cast

Kux Machine Co.—What can't be found in 22-page brochure "Kux Die Casting Machines" about this equipment isn't worth knowing. Booklet describes and illustrates 13 different models along with pictures and information on parts and component assemblies. Complete specifications are tabulated.

59. Stationary Melting Pot

Stroman Furnace & Engineering Co.—Let your aluminum, zinc, lead and other white metal alloys go to pot—a Stroman iron pot stationary melting furnace, that is. Gas and oil-fired units are made in various capacities and have the features you want in your equipment. Furnaces described, specs given in illustrated data sheet No. 115.

60. Carbon & Graphite Products

National Carbon Co.—It's all in 20-page catalog section S-5005—descriptions, illustrations, graphs, tables and specifications concerning National carbon and graphite and Karbate impervious carbon and graphite products for chemical, metallurgical, mechanical and electrical applications.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

FOUNDRY
Penton Building, Cleveland 13, Ohio

2-52

Please send literature or detailed information on subjects circled at left to—

NAME _____ TITLE _____

COMPANY _____

PRODUCTS MANUFACTURED _____

ADDRESS _____

CITY AND STATE _____

This card MUST be completely filled out. Please TYPE or PRINT.

1	13	25	37	49	61	73	85	97	109
2	14	26	38	50	62	74	86	98	110
3	15	27	39	51	63	75	87	99	111
4	16	28	40	52	64	76	88	100	112
5	17	29	41	53	65	77	89	101	113
6	18	30	42	54	66	78	90	102	114
7	19	31	43	55	67	79	91	103	115
8	20	32	44	56	68	80	92	104	116
9	21	33	45	57	69	81	93	105	117
10	22	34	46	58	70	82	94	106	118
11	23	35	47	59	71	83	95	107	119
12	24	36	48	60	72	84	96	108	120

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

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Cleveland 13, Ohio

Readers' Service Dept.

61. Rock-a-Bye Melting

Kuhlman Electric Co., Detroit Electric Furnace Div.—Read all about how pedestal and base-mounted electrode brackets, indirect arc and rocking action are combined in Detroit Rocking electric furnaces to produce superior melts at high speed. Just ask for bulletins 504 and 505. Ratings of 30 to 600 kw fulfill most needs.

62. Cutout to Cutoff

Tabor Mfg. Co.—Cut out the stalling and get this batch of literature—three folders and three specification sheets — which describe Tabor-Brasive universal and standard cut-off machines. Six types are shown along with descriptive data. Well, what you waiting for?

63. High Temperature Firebrick

Babcock & Wilcox Co., Refractories Div.—Furnace linings of B & W Allmul fused alumina-silica firebrick will withstand temperatures to 3200° F. 4-page technical bulletin R-29 lists properties and performance characteristics of this multiple-use refractory.

64. Floating on Air

Yeomans Brothers Co.—Most heavy, bulky materials can be conveyed through pipe lines with the pneumatic ejector Transporter described in 8-page illustrated bulletin 4500. Fully automatic, adjustable and foolproof, this unit is offered in sizes ranging from 10 to 200 cu ft displacement.

65. Lithium Conquers Gas

Metalloy Corp.—Should your high conductivity copper and copper-base alloys be suffering from gas caused by formation of steam, treat them with Lithium, a soft, silvery white metal, as prescribed in 4-page data sheet. It completely removes oxygen. Get this report, it may be just what the doctor ordered.

66. Thermocouples

L. H. Marshall Co.—The Marshall (thermocouple) Plan is your key to closer temperature control. This 8-page catalog with many illustrations gives all the dope and prices on enclosed-tip thermocouples, complete stationary units for nonferrous molten metals, portable units, replacement units and parts.

67. Oven Furnaces

Eclipse Fuel Engineering Co.—Not ovens or furnaces, but oven furnaces is subject of this 8-page illustrated bulletin D-7, which expounds valuable info on equipment for hardening, carburizing, normalizing, annealing and drawing. See all the specs for various sizes. You should have this in your files.

68. Pyrometers

Illinois Testing Laboratories, Inc.—As a bonus with 2-page illustrated bulletin No. 1724-D on Pyro Lance portable pyrometer (designed for accurate measurements under severe operating conditions in nonferrous foundries), company is offering 12-page illustrated bulletin No. 4257 on Alnor Pyrocon contact pyrometer for surface temperatures. If you measure temperatures, get these bulletins, your processes may be dying by degrees.

69. Salt Descaling

Hooker Electrochemical Co. — So you have castings of various types that have to be descaled or desanded. By sending for illustrated 8-page bulletin No. 25 on Virgo salt descaling, you get the straight info on process which uses Virgo Molten Cleaner. Sand is removed, surface is degraphitized, rust and scale is removed, stress relieving takes place—simultaneously (at once).

70. Tumble-Blast Mill

American Wheelabrator & Equipment Corp.—This company with the long name can make short work of your high production cleaning problems with its continuous Wheelabrator Tumblast, described and illustrated in 8-page bulletin No. 514. How it works, how it can be applied to your use and records it sets are covered. Find out about company's testing lab, too.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

71. Mobilization Planning

So you'll not be caught with your plans down, send for 4-page reprint "Company Mobilization Planning." In it author Donald Armstrong, president of United States Pipe & Foundry Co., presents an industrial mobilization plan for foundries that would give a picture of how a plant's facilities and personnel can contribute to defense. Don't miss this one.

72. Reports to Management

Albert E. Grover, Cleveland cost consultant, in his article "The Accountant Reports to Management" says that for most effective use, reports to foundry executives must be thoroughly comprehensive, accurate and timely, but simple to understand. Various types of report forms which fill these qualifications are described in 8-page reprint which is yours for the asking.

73. Casting Grinding Balls

Steel grinding balls used in mining and cement industries are produced automatically at rapid rate by machine described and illustrated in 6-page reprint "Casting Grinding Balls Continuously." So get on the ball, get this article and read all about this unusual foundry machine.

74. Community Relations

Here's a recent reprint that offers a real word to the wise. It's entitled "Community Relations—Management's Responsibility" and encourages company leaders to extend their leadership into beneficial civic activity as a means of developing and maintaining community good will and respect. Author A. G. Freeman, public relations counsel of Dayton Malleable Iron Co., has something here.

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Cleveland, Ohio

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6	18	30	42	54	66	78	90	102	114
7	19	31	43	55	67	79	91	103	115
8	20	32	44	56	68	80	92	104	116
9	21	33	45	57	69	81	93	105	117
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11	23	35	47	59	71	83	95	107	119
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FOUNDRY
Penton Building, Cleveland 13, Ohio

2-52

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NAME _____ TITLE _____

COMPANY _____

PRODUCTS MANUFACTURED _____

ADDRESS _____

CITY AND STATE _____

This card MUST be completely filled out. Please TYPE or PRINT.

When your eye is on Pittsburgh—and three dozen towns in its orbit—you're spotting scores of furnace operations regularly checked by Cities Service Heat Provers. Here, where they know all kinds of furnace instruments, and where high efficiency is most urgent today, the application of Heat Provers by Cities Service is increasingly valued.

It takes the Heat Prover to read simultaneously for oxygen and combustibles, measured direct by actual gas analysis. And the Heat Prover's continuous rapid sampling reveals effects of furnace adjustments at once. The Heat Prover frees you of maintenance too, because it's *not an instrument you buy, but a Service we supply.* Learn how it can raise productivity for you . . . in iron, steel, ceramics, glass, cement or any other furnace operation. Write CITIES SERVICE OIL COMPANY, Dept. B41, Sixty Wall Tower, New York City 5.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Always,

all ways,
A Well-Made
Pattern

Over 40 years' experience in 'Well-made' Wood and Metal Patterns

Drop us a note on your business letterhead and we'll be glad to send you the Wellman magazine every month.

THE WELLMAN BRONZE & ALUMINUM CO.

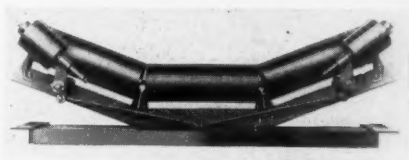
2511 EAST 93rd STREET-CLEVELAND, OHIO

(*Continued from page 224*)

ner of the series, at the end opposite the spark ignitor. If its contacts are not closed by the flame in the ignited gas burner upon release of the manual push button, the automatic valve will close, shutting off gas supply to all burners.

For More Details Circle No. 13—Page 225

Training Carrier: Stephens-Adamson Mfg. Co., Aurora, Ill.—Conveyor belt training carrier is said to perform satisfactorily when installed at intervals of 50-100 ft. Training rollers respond instantly to any shift of the belt off dead center and tilt the carrier into an angular position with respect to the direction of belt travel. This returns the belt to center and the carrier resumes its normal position. Edge wear of the belt is said to be negligible with this carrier and its use insures against any possiblity of serious belt damage due to improper training.



For More Details Circle No. 14—Page 225

Dump Truck: Kalamazoo Mfg. Co., 1827 Reed St., Kalamazoo 24F, Mich.—Truck is powered by a 2-cylinder, 13-hp air-cooled Wisconsin engine and has three speeds forward and one reverse. Maximum forward speed is 15 mph. When equipped with a ½-cu yd, self-dumping hopper manufactured by Roura Iron Works Inc., Detroit, it is converted into a dump truck. Hopper can be discharged from the drivers' seat.

For More Details Circle No. 15—Page 225

Power Trolley: Yale & Towne Mfg. Co., Philadelphia Division, 11000 Roosevelt Blvd., Philadelphia 15—Motor-driven trolley uses a hydraulic coupling which transmits power from motor to the drive unit through a cushion of oil. Since the motor in the new trolley starts unloaded and comes up to 85 per cent of full speed before starting the load, there is no prolonged inrush of current. Power

(*Continued on page 231*)

THREE GREAT "MAG" FURNACES

FOR FOUNDRIES, DIE CASTING and PERMANENT MOLD PLANTS

1. Furnace with hood open.

2. Furnace with hood open for dipping.

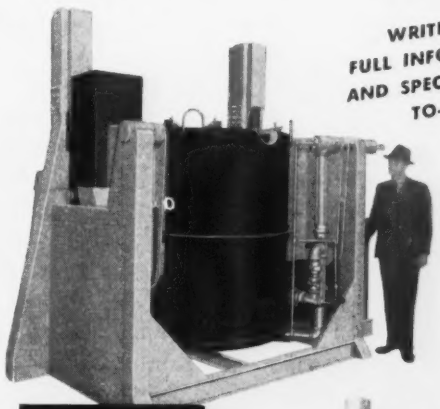
3. Furnace with opening and trough for hot charging.

NEW!

STROMAN TYPE SFE MAGNESIUM MELTING AND HOLDING FURNACES

These furnaces were designed to meet the demands of the industry for faster, more efficient and most economical magnesium melting. Their engineering incorporates many exclusive features. They come complete with sulfur dome and hood. Provisions for hot charging through hood and dome are included. They are excellent furnaces for permanent mold, die casting and sand casting operations. The hoods provide ample venting for the gases of combustion, sulfur and fluxing fumes. They come complete with blowers and choice of oil or gas fire. Automatic controls are also available if desired. Capacities: 250- 350- 600- 800- 1200- 1600-pounds.

WRITE FOR FULL INFORMATION AND SPECIFICATIONS TO-DAY!

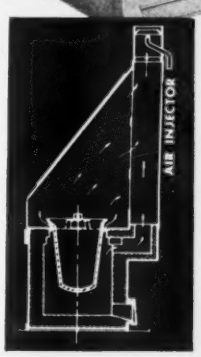


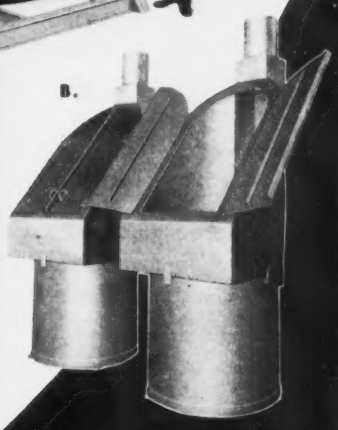
A.

STROMAN MAGNESIUM AND ALUMINUM MELTING AND HOLDING FURNACES

A. Hydraulic Tilt Magnesium and Aluminum melting furnace handling from 500 to 3000 lbs. of aluminum. Incorporates the famous Stroman Stationary Lip Pour, which creates a constant pouring arc at any desired pouring speed. Saves time and metal. These furnaces may be so arranged in series so that several may be operated from one hydraulic pump unit.

B. Stationary Super-Heating or Melting Furnaces, Type S. F. Designed to deliver the correct super-heat to magnesium after it has been melted in larger furnaces, and before it is poured into the molds. Can also be used for breakdown or holding. They have all safety features. Are available for cast steel pots or fabricated steel pots. Furnaces may be equipped with hoods if so desired, for the venting of combustion and other gasses. Write for bulletin No. 100.





B.

LET STROMAN SOLVE YOUR NON-FERROUS METAL MELTING PROBLEMS • WRITE TO-DAY!

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

DRAW CORES 3 TIMES FASTER . . . improve quality, too

SUTTER Automatic Draw Machine with Power Rollover

The Sutter Core Draw Machine is completely automatic. The operator needs only to push the start button and remove the drawn cores from the table. Since this automatic cycle takes only six seconds—from clamping of the dryer until the drawn core rests on the table—production is increased 300% to 400%. At the same time, because every core is drawn automatically and uniformly, even unskilled operators can maintain peak output of the most complicated cores.

The Sutter Core Draw Machine is equipped with a double rollover frame so that the operator can blow one core while another is being drawn. Power-rollover and draw have speed control for regulation to any production cycle. Thus, these versatile machines may be used with an automatic core blower—on either or both sides—where the operator blows and draws cores or in a loop set-up where cores are hand drawn.

Four standard sizes meet the requirements of most foundry applications but specials can be developed for the unusual job. Complete information is contained in Sutter Bulletin "F". Send for it today.

SUTTER PRODUCTS COMPANY

2005 WESTWOOD AVENUE • DEARBORN, MICH.

(*Continued from page* 228)
requirements are said to be less than half of normal with accompanying reduction in motor heating and maintenance. The fluid coupling replaces complex electrical speed changing equipment. Acceleration through the coupling is smooth and gradual without vibration or jerking. This reduces swinging or pendulum action by the load. The coupling also permits reversal of the motor from full speed forward to full speed reverse, providing smooth yet rapid deceleration and stoppage or complete reversal. Need for a motor brake on the trolley is eliminated. The fluid coupling is available for all company power-driven trolleys from ⅛ to 12 ton capacity.

For More Details Circle No. 16—Page 225

Metallizing: Metallizing Engineering Co., 38-14 30th St., Long Island City 1—Two new metallizing guns for high spraying speeds provide

near automatic operation. They incorporate a jet siphon principle in the gas head which automatically compensates for variations as high as 10 lb. in gas pressure, and provides a steady flame which produces uniform coatings. Guns also incorporate automatic control of wire feed which compensates for kinks in the wire, reel stand drag, etc. Type 4E gun is designed to spray all wires from 20 B&S gage to ⅛-in. in any metal—carbon steels, stainless, Monels, bronze—at speeds up to 40 per cent faster than previous models. Type 5E is specifically designed for high speed spraying of the softer metals, such as zinc and aluminum. It sprays 3/16-in. wire and will deposit as much as 55 lb of zinc per hour—aluminum, 15 lb per hour.

For More Details Circle No. 17—Page 225

Paint Roller: American Products Co., 3308 Edson Ave., New York 66—Heavy duty paint roller is said to make possible the painting of sur-

(*Continued on page* 234)

Ask STANDARD CONVEYOR

How you can cut costs • speed operations • gain:

- ✓ REDUCED HANDLING TIME
- ✓ UNINTERRUPTED SMOOTH FLOW IN PRODUCTION
- ✓ CAREFUL, SAFE HANDLING OF LIGHT OR HEAVY MOLDS—
- ✓ BETTER STORAGE FACILITIES
- ✓ CONSERVE AND UTILIZE EXISTING FOUNDRY SPACE

Conveyors are unequalled in low first cost, flexibility of application for a variety of foundry handling needs, minimum operating or maintenance expense.

Foundry conveyors are designed and built in their entirety by Standard including the vital bearings, sealed and shielded—expressly designed for severe foundry service.

Available in a wide range of sizes, weights and types — as complete systems—or individual portable sections. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

Send for Standard's special catalog "Conveyors for Foundries" — a valuable reference book illustrating and describing conveyor installations in leading foundries.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul 9, Minn.
Sales and Service in Principal Cities

Standard
GRAVITY & POWER
CONVEYORS

Engineered Conveyor Systems — Portable Conveyor Units — Spiral Chutes — Pneumatic Tube Systems

EQUIPPED WITH SEALED AND SHIELDED BEARINGS
SPECIALLY DESIGNED FOR FOUNDRY SERVICE

YOU can be proud

of your part in building a better America

Something wonderful has happened in our country during the past 10 years, and you have been a part of it.

It all started during the first dark days of World War II.

One of Uncle Sam's biggest problems was how to get a thousand and one things done *voluntarily* on the home front. Public-spirited business leaders offered their services *free*.

They formed the Advertising Council to tell the story. They called upon America's unmatched communications forces to help. Soon millions of messages were going out in magazines, newspapers, radio and posters, without cost to the taxpayer.

Wars take money. So the Council got behind the Treasury's War Bond Drives, and the nation responded as it always does to a just cause.

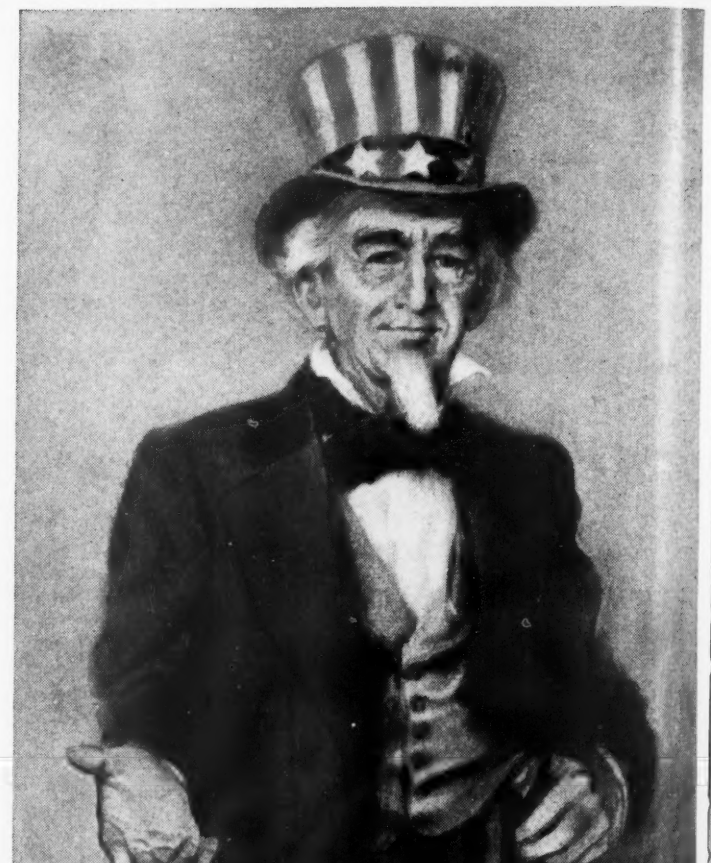
Wars chew up raw materials fast. So the Council helped Uncle Sam conduct salvage campaigns for metals, fats and paper. Again *you* met the need.

Then came campaigns on forest fire prevention, Victory Gardens, "loose talk," rationing, nurse recruitment and many others. And each time, when they learned the need, the people acted.

But this voluntary service did not end with the war. By popular demand, it began to help such peacetime causes as Savings Bonds, Highway Safety, Community Chests, Red Cross, Economic Education, Crusade for Freedom, Better Schools, Civil Defense and Blood Donation.

Over a billion and a half dollars in advertising space and time have been given freely by American business to do these vital jobs in the public interest. Hardly an American but knows about them and has had some part in their progress.

This publication salutes the Advertising Council on its Tenth Anniversary as a wonderful example of American teamwork. Its achievements are a tribute to the whole American people—to business that supports its activities—to all those devoted workers, in so many fields, who have helped to tell you what needed doing. But most of all to *you* who *did* it!



Reminded by ads like this, contributed by the magazines of America at no cost to Uncle Sam or the taxpayer, you now own over $35 billion in Defense Bonds.

What the Advertising Council Is

. . . and what it does

As it starts on its second decade, the Advertising Council is a fine example of the conscience of America in action. It is a voluntary organization—independent, non-profit, non-partisan—dedicated to the welfare and progress of all our people.

It is composed largely of advertisers, agencies and media, including magazines, newspapers, radio and television, the outdoor and transportation advertising groups.

The Council's budget is contributed by business generally. Space and time for Council programs are donated by advertisers and media. Advertising agencies provide free all the creative talent needed for the preparation of campaign materials.

As the first organized, systematic method of getting important messages to the public quickly, the Council annually reviews hundreds of requests for help from government agencies and leading non-profit organizations which have learned that advertising—through simplification, dramatization and repetition—gets things done.

Closely associated with the Council is an Industries Advisory Committee consisting of 38 business leaders and a Public Policy Committee which evaluates requests for campaigns. The latter includes 20 leading representatives from the fields of management, labor, education, agriculture, religion, medicine and journalism.

All these good Americans have accomplished much by working together. But so much *more* still remains to be done! This publication is confident that the Advertising Council will continue to do its part by giving you the facts about national problems as they arise, so that in the future as in the past, they will be met in the traditional voluntary American way.

When scrap is needed quickly to keep our defense plants rolling, ads like this, sponsored by leading business and trade publications, help to make that need known.

The messages you see and hear over radio and television on behalf of national causes such as Better Schools, Blood Donors, CARE, Fight Inflation and Racial and Religious Prejudice, are scheduled by the Council. Stars, advertisers, agencies, networks and local stations all cooperate.

The posters along the thoroughfares and in your transportation vehicles often carry messages in the public interest. The space is given by the Outdoor and Transportation advertising industries.

The Council also serves American Cancer Society, American Heritage, Boy Scouts, Brotherhood Week, Christmas Seals, 4-H Clubs, Flag Day, Girl Scouts, Heart Fund, Religion in American Life, Salvation Army, United Negro Colleges, and many other projects in the public interest.

You learned of the nurse shortage from ads like this, many of them contributed by daily, weekly and labor newspapers. During the past five years, 418,000 young women have responded.

We must increase American productivity if we are to meet our defense needs and maintain a strong civilian economy. House magazines of leading companies carry ads like this regularly.

A PUBLIC SERVICE PROJECT
THE ADVERTISING COUNCIL

This advertisement is contributed by
FOUNDRY
magazine as a public service.

"FALLS BRAND" ALLOYS
AMERICA'S LARGEST PRODUCERS OF ALLOYS

"FALLS" CHROMIUM COPPER

By introducing chromium copper into copper—for the production of copper castings and drawn copper—the results are alloys of greater strength, hardness, electrical and thermal conductivity. These elements make them superior to pure copper in all applications which require conductivity, wear resistance and resistance to softening under continuous heat.

"Falls" Chromium Copper is furnished in shot form or bars to facilitate handling—and is supplied in two percentages and two forms.

"Falls" 5% Chromium Copper conforming to the following composition:

Chromium	4.0—6.0%
Total impurities	0.8%
Copper	Balance

"Falls" 10% Chromium Copper conforming to the following composition:

Chromium	8.0—11.0%
Total impurities	1.0%
Copper	Balance

WRITE TO US FOR DETAILED INFORMATION

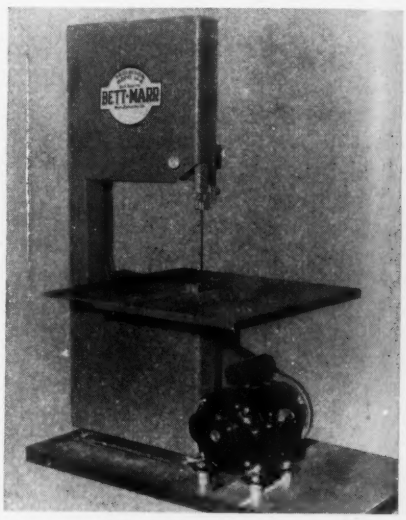
NIAGARA FALLS
Smelting & Refining Division
Continental Copper & Steel Industries, Inc.
BUFFALO 3, NEW YORK

(*Continued from page* 231)

faces from a standing position on the floor, reducing hazards inherent in use of ladders or scaffolds. The large diameter lambswool roller works with oil, water, or rubber base paints. Rollers run on oversize brass bearings and come in 9, 14, and 18-in. widths. Four-foot handle is standard. Longer poles may be attached easily.

For More Details Circle No. 18—Page 225

Band Saw: Bett-Marr Mfg. Co., Hopkins, Minn.—Saw features chain-drive gear said to eliminate blade chatter and allow full power at slow speeds for cutting iron and steel castings, sheet metal, and wood. Selective speeds range from 125 to 2200



fpm and saw blades up to and including ½-in. may be accommodated. Cuts up to a depth of 8¾-in. may be made. Table is 20 x 22 in.

For More Details Circle No. 19—Page 225

Hose: Mercer Rubber Corp., 66 Reade St., New York—Multipurpose, industrial hose is said to be both oil and abrasion resistant. It is designed for handling air, welding gases, cold water, hot water, paint, oil, grease, and gasoline. It has a smooth bore permitting uninterrupted, fast flow even though reeled. It has a black cover and is available with one or two braid, high tensile reinforcement in seven sizes, ranging from 3/16-in. to 1 in. ID, suitable for 250-lb working pressures.

For More Details Circle No. 20—Page 225

Diesel Powered Truck: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle Creek, Mich—Diesel power is available for the company's Yardlift-40 fork lift truck. The engine, a model DIX-4D Hercules, provides 44 brake horsepower at 1950 rpm. Maximum torque developed is 118 ft-lb. Major

(*Continued on page* 236)

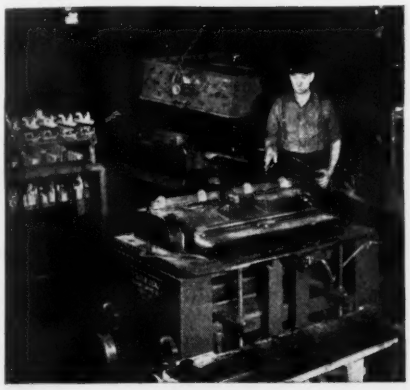
INTERNATIONALS

90 Standard Types
1400 Different Sizes

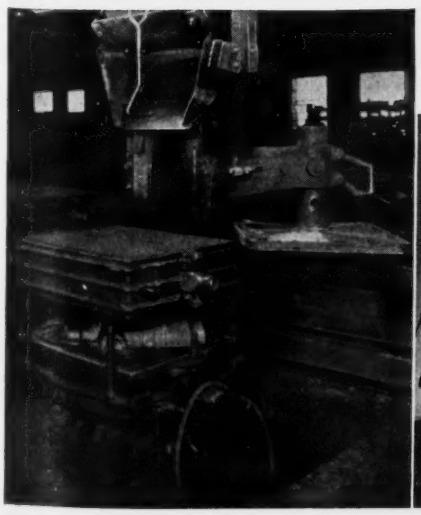
Many Special Designs
to meet
Special Requirements

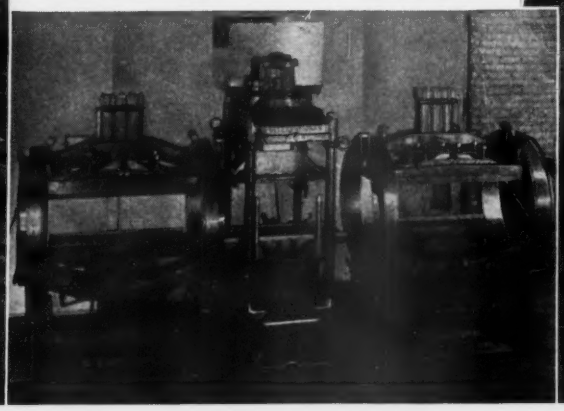
Foundries in which
MAXIMUM PRODUCTIONS
are maintained are equipped
with

INTERNATIONALS



INTERNATIONAL
MOLDING MACHINE CO.
La Grange Park, Illinois





Foundry work moves faster with

To meet demands for greater production and higher efficiency, many progressive foundries are replacing obsolete, undependable handling equipment with new heavy duty, two-speed Meteors. Designed specifically for foundry work, the Meteor provides slow speed for careful starting of loads...and high speed for fast lifting when the load is free. The Meteor is fully enclosed, weather-proofed and protected against dust and dirt. Airplane-type cooling fins quickly dissipate heat generated by gears and load brake. Low headroom, precision construction, motor thermal protection, only 110 volts in push button station, helical gears, are other quality features. If you want extra value for your investment, write today for literature and prices.

WRITE *for Bulletin 142...contains 22 pages of specifications, illustrations and prices.*

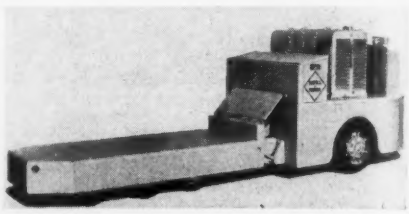
CHISHOLM-MOORE
HOIST CORPORATION
(Affiliated with Columbus McKinnon Chain Corporation)
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.
SALES OFFICES: New York • Chicago • Cleveland • San Francisco • Los Angeles

(Continued on page 234)

lift truck specifications, such as 85½-in. turning radius, overall width of 41¾-in., length, etc., remain the same; the only operating changes will be those associated with diesel operation.

For More Details Circle No. 21—Page 225

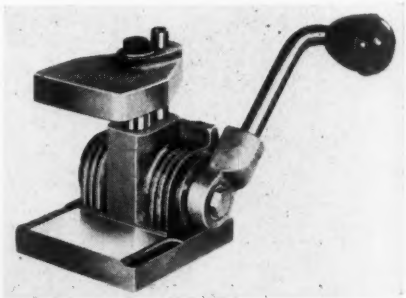
Transport Truck: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland—Electric-powered low-lift platform truck is designed for transporting loads weighing up to 40,000 lb. Skid or skid box loads are lifted hydraulically by the load platform for transport. Truck is not designed



for tiering or stacking operation; its principal function is for horizontal transportation. Overall length is 193 in., width 56½ in. The platform measures 96 in. long by 41 in. wide by 17½-in. high in the lowered position, although these dimensions can be altered to suit requirements. Six-in. platform lift is available. Two 22 x 10 in. drive tires and six 15 x 10 in. trail tires are standard. The truck illustrated is equipped with a standard gas-electric unit, although storage battery power can be used, depending on operating requirements. Power steering for all eight wheels facilitates maneuvering in close quarters.

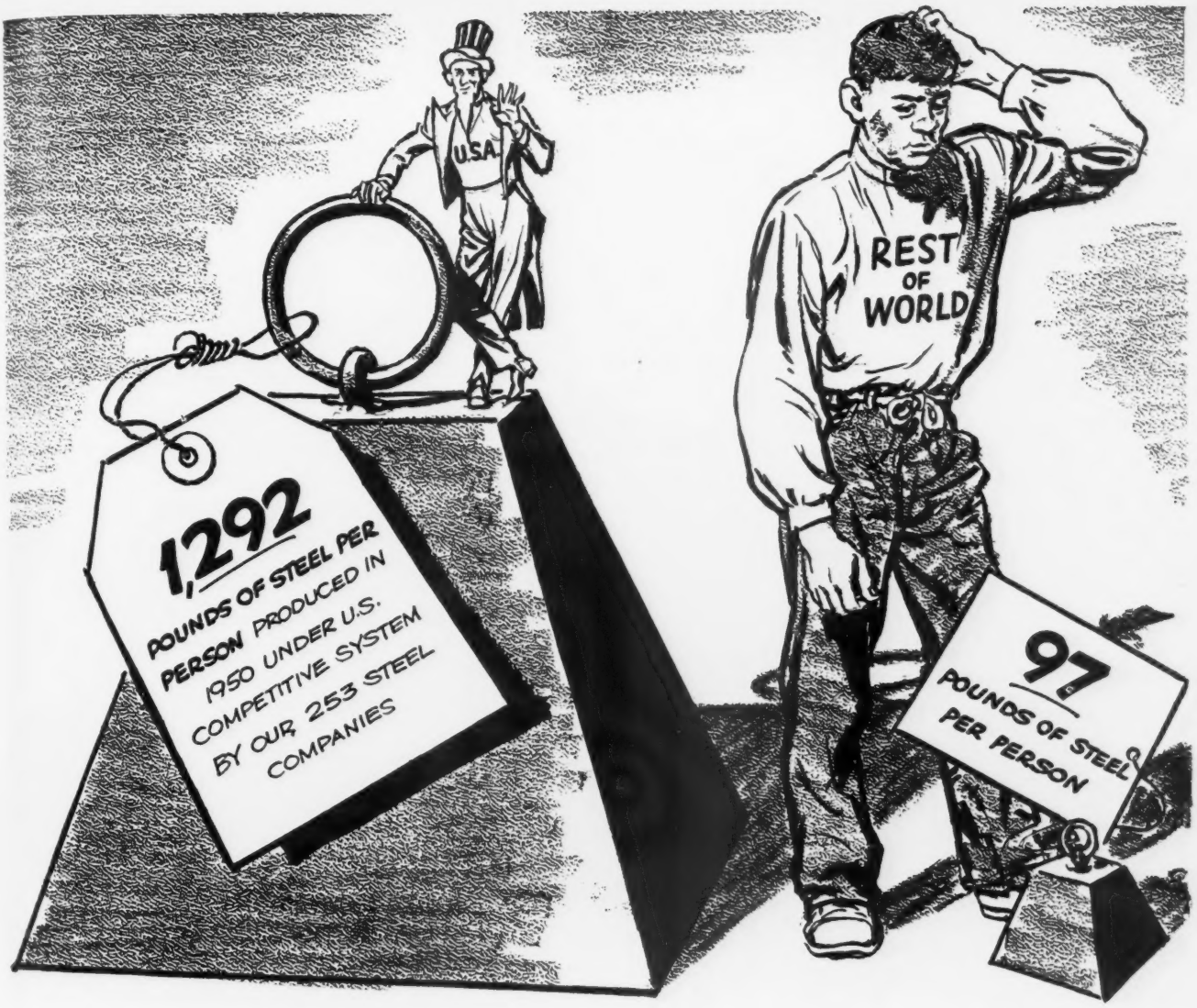
For More Details Circle No. 22—Page 225

Jig: Esco Engineering Corp., 1940 East Woodbridge, Detroit 7— Single post drill jig, combining small size economy with accurate alignment and easy release locking, is recommended for drilling small parts and for short and medium size runs. Jig pro-



vides an infinite number of locking positions due to its cam action. Locking is positive and requires no pressure, yet releases instantly with a slight lift of the locking handle, it is claimed. Base and top plate are machined, as is the back, which forms a

(Concluded on page 238)


USA
1,292
POUNDS OF STEEL PER PERSON PRODUCED IN 1950 UNDER U.S. COMPETITIVE SYSTEM BY OUR 253 STEEL COMPANIES
REST OF WORLD
97
POUNDS OF STEEL PER PERSON

FORTY YEARS AGO the automobile was a rich man's toy. TV and radio were unheard of. Refrigeration? You hung a card in the front window to signal the ice man.

Today we drive 40 million cars, listen to 90 million radios, keep food in 33 million refrigerators.

Yet millions in the rest of the world are still groping in the primitive darkness of 40 years ago.

Why have we moved ahead? Competition is a chief reason. Only competition in business has made luxuries commonplace in your home today. Competition, for example, in the production and sale of steel and things made out of steel.

Steel makes progress possible—in war or peace . . . in the manufacture of everything from tableware to tanks, razor blades to skyscrapers, baby carriages to "Big Mo".

How well does this competition of ours work in the steel business?

. . . The U.S.A. shows an 83.4% gain in steel output between 1939 and 1950. The rest of the world shows an 0.8% loss.

. . . In 1939, the U.S.A. under "competition" made ⅓ of all the world's steel. Today we produce half—all with only 6% of the people in the world.

. . . Steel workers under "competition" gained in jobs, too. There were 449 thousand jobs in 1939. Today—637 thousand.

The steel industry is just one example of how a free competitive system works. Ours is the security millions of people in the world dream of when they embrace such dead-ends as "planned economies".

Look around and see what happens when people hand their jobs and factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism","regimentation"—it is a one-way street, and no turning back. By then people no longer own government. Government owns the people.

• • •

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THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE

Measure★ Your Mixing

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★ **Measure** ***by Man-Hour Productivity!***

★ **Measure** ***by Power and Maintenance Economy!***

★ **Measure** ***by Casting Quality!***

Before you buy your next mixer for foundry sands—"measure" it! Measure it in terms of man-hour productivity. . . of power and maintenance economy. . . of quality castings produced. You'll find that "Lancaster" Mixers measure high in foundry practice because:
(1) Formulas of any kind are mixed with perfection and uniformity.
(2) Mixes are fluffy and lump free—no further aeration is needed.
(3) "Lancaster" Mixing is thorough. . . yet "Lancaster" Mixers are easily and economically maintained.
(4) Despite the speed of "Lancaster" mixing, no heat is generated in the mix.
(5) "Lancaster's" are "power misers" operating at maximum capacity on minimum power requirements.
There's a "Lancaster" Mixer that's just right for every sand mixing job in the foundry. Write today for free bulletin and engineering data. No obligation.

For:
GENERAL PURPOSE SANDS
FACING SANDS
CORE SANDS

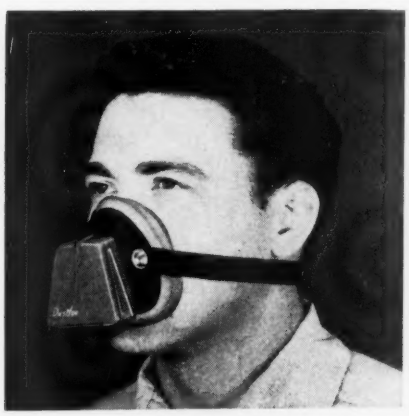
POSEY IRON WORKS, Inc.
Brick Machinery Division
LANCASTER, PENNSYLVANIA

(*Concluded from page 236*)

right angle with the base for optional use in a side or lying-down position. Accurate alignment between bushing plate and base is maintained by a hardened and ground post and alignment dowel. The post also serves as raising and lowering rack, with a 1-in. stroke.

For More Details Circle No. 23—Page 225

Respirator: B. F. McDonald Co., 5112 South Hoover St., Los Angeles—Respirator features a preformed throw-away filter with chemically induced static electrical field that attracts dust particles and supplements mechanical filtering action of the filter fibres. Designed to increase its



wearer's downward vision and to eliminate "blind spots," the unit, including an aluminum face piece which can be molded to any facial contour, weighs less than 3 oz. Breathing resistance is low, and the air intake is located at the bottom of the respirator. Counter-gravity air flow prevents heavier dust particles from reaching the filter.

For More Details Circle No. 24—Page 225

Motors: Reuland Electric Co., Alhambra, Calif.—Slip-ring motors have wide usage where variable speed or high starting torque on low starting current is required. Motors feature a new arrangement of the collector rings and brush assembly which permits their complete housing in the motor's regular end bell. This reduces overall motor dimensions with increased protection against arcing and flashing. Motors also provide mounting versatility through use of flat end bells. Brakes and other equipment can be attached on either end, using face or flange type mountings. Units can be mounted in any position. Motors are available separately in ratings from ¾ to 15 hp or, in conjunction with gear reducers, from ¾ to 5 hp; either drip-proof or totally enclosed.

For More Details Circle No. 25—Page 225

How YOUR Metal Situation is Helped When a Salesman Turns Reporter

Today's non-ferrous metals picture will very likely change tomorrow. Prices, quantities, regulations and availabilities change fast and often. The foundryman who gets the latest news is often the one who produces *and profits* while others wait.

By reporting metal facts to you speedily and accurately your Federated salesman helps keep you posted. From metals headquarters . . . where supply, production and research news is *made* . . . he brings you the facts which will enable you to act most profitably.

These days when you can't always get what you want when you want it, keep in touch with your Federated salesman for facts, for technical help that will assist you to do the best you can under the circumstances.

Federated Metals Division

Federated first in the non ferrous field FMD

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

Industry BRIEFS

TRACKSON Co., Milwaukee, producer of tractor mounted machines, has become a wholly owned subsidiary of Caterpillar Tractor Co., Peoria 8, Ill. Louis B. Neumiller, Caterpillar president, will be chairman of a reconstituted Trackson board of directors, which will include Walter H. Stiemke, Trackson president, and William Blackie, Ralph M. Monk, and J. R. Munro of Caterpillar. Mr. Stiemke and L. E. Dauer, Trackson vice president, will continue in their present administrative capacities.

* * *

Eclipse Fuel Engineering Co., Rockford, Ill., recently moved into new factory and office building on Buchanan St. Further expansion plans include addition of oil-firing devices to the company's line of gas-fired equipment, and erection of a testing laboratory for combustion research on a site opposite the new factory.

* * *

Norton Behr-Manning Overseas Inc., Worcester 6, Mass., has formed a new sales-distributing company at Mexico City, Mexico, known as Norton Behr-Manning, S.A. de C.V. Dealer organizations previously representing the parent company in Mexico will remain unchanged. Herbert A. Stanton is president of the new company, and Edgar A. Maschal, formerly of Durex Abrasives Corp., is vice president and general manager.

* * *

Farrel-Birmingham Co., Ansonia, Conn., has acquired Consolidated Machine Tool Corp., Rochester, N. Y. Consolidated will be operated as a subsidiary of Farrel-Birmingham, and will continue production of its machine tool lines. Arthur H. Ingle remains Consolidated president and will become a director of Farrel-Birmingham.

* * *

Wellman Bronze & Aluminum Co. has moved its general offices to Shaker Square, 12800 Shaker Blvd., Cleveland 20, centralizing its sales department and placing all management personnel under one roof.

* * *

International Minerals & Chemical Corp., Chicago, has acquired Eastern Clay Products Inc., Jackson, O., as noted briefly in January "Late Foundry News." Eastern Clay, to be known as the Industrial Minerals Division of the parent company, operates clay and bentonite plants in South Dakota, Mississippi and Ohio. A refractories plant is operated at Jackson, and equipment and refractory specialties are produced at other points.

* * *

Stamford Engineering Works, 507 Canal Street, Stamford, Conn., has secured the sales and service agency for the British Molding Machine Co., Faversham, Kent, England, manufacturers of molding machines; and Luke & Spencer Ltd., Broadheath Altrincham, Cheshire, England, producer of grinding machines.

* * *

Forged Fittings Corp. has been incorporated in New York as a foundry and machine shop. Capital stock was listed at $105,000. Directors are Ests Sidrane, 1290 Ocean Ave., Antonio A. Benedetti, 2342 East 21st St., and Sarah A. Watts, 1286 East Eighth St., Brooklyn, N. Y.

* * *

Gray-Syracuse Co., Industrial Building, 107 North Franklin St., Syracuse, N. Y., has acquired additional floor space in that building for expansion of its facilities. Harold P. Gray started the investment casting firm in 1946.

* * *

Zenith Foundry Co., 1501 South 83rd St., West Allis 14, Wis., has purchased a tract of land, containing two buildings, adjacent to its plant. The foundry previously had rented the property.

* * *

Barrow Foundry Co., Dover, Del., has been incorporated with capital listed at $500,000. Corporation Trust Co., 100 West Tenth St., Wilmington Del., is serving as the principal office.

* * *

Shenango-Penn Mold Co., Pittsburgh (Neville Island), Pa., suffered fire damage estimated at $100,000 Dec. 11.

* * *

Hewitt-Robins Inc., New York, has moved its Philadelphia office and warehouse to Coral & Hagert Sts., from 401 North Broad St.

* * *

Battle Creek Foundry Co., 985 North Raymond Rd., Battle Creek, Mich., suffered $200,000 loss in a fire Dec. 24.

* * *

Lithium Corp. of America, 2560 Rand Tower, Minneapolis 2, is nearing completion of a $250,000 flotation mill for recovering spodumene concen-

(*Concluded on page* 242)

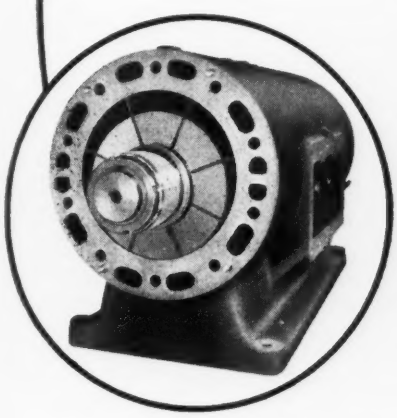
NEW ADMINISTRATIVE HEADQUARTERS of Baroid Sales Division, National Lead Co., recently were opened at 2404 Danville St., Houston, Tex. The two-story building of stone, brick and glass contains laboratory facilities for organic and analytical chemistry, mud analysis, and instrument design; foundry and training laboratories; mills for grinding raw materials; complete photographic and printing facilities, a technical library, and general offices. George L. Ratcliffe is general manager

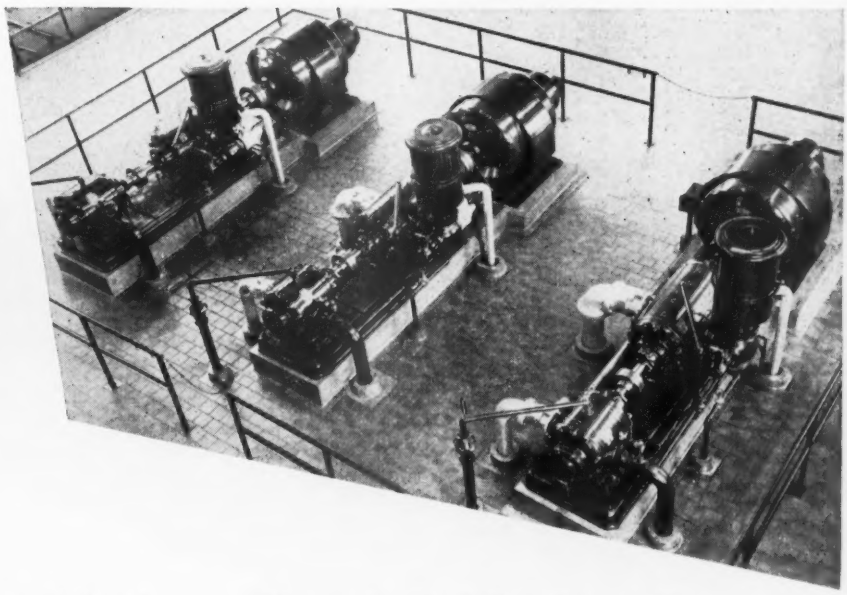
FULLER ROTARY COMPRESSORS

ELIMINATE . . .

Complicated, Moving Parts . . .

for economical operation





Fuller Rotary Compressors are designed and built to be dependable and economical in operation . . . to give a lifetime of new machine service. They have but few moving parts—rotor, bearings, and blades. That means minimum maintenance and infrequent inspection. Because blades automatically compensate for wear, *full capacity is maintained for the life of the machine.* Every detail in Fuller compressors is engineered for one purpose . . . to give you the best machine money can buy.

Thousands of Fuller Rotary Compressors are maintaining peak efficiency in plants of every size and description throughout the country. They've *earned* their reputation for complete dependability.

Fuller engineers will be glad to work with you for the proper application of Fuller compressors to your particular requirements. Bulletin C-5 gives you complete information on these quality built compressors. You'll want to study it carefully . . . see how well Fullers fit into your own plans and operations.

Fuller

DRY MATERIALS CONVEYING SYSTEMS AND COOLERS
COMPRESSORS AND VACUUM PUMPS
FEEDERS AND ASSOCIATED EQUIPMENT

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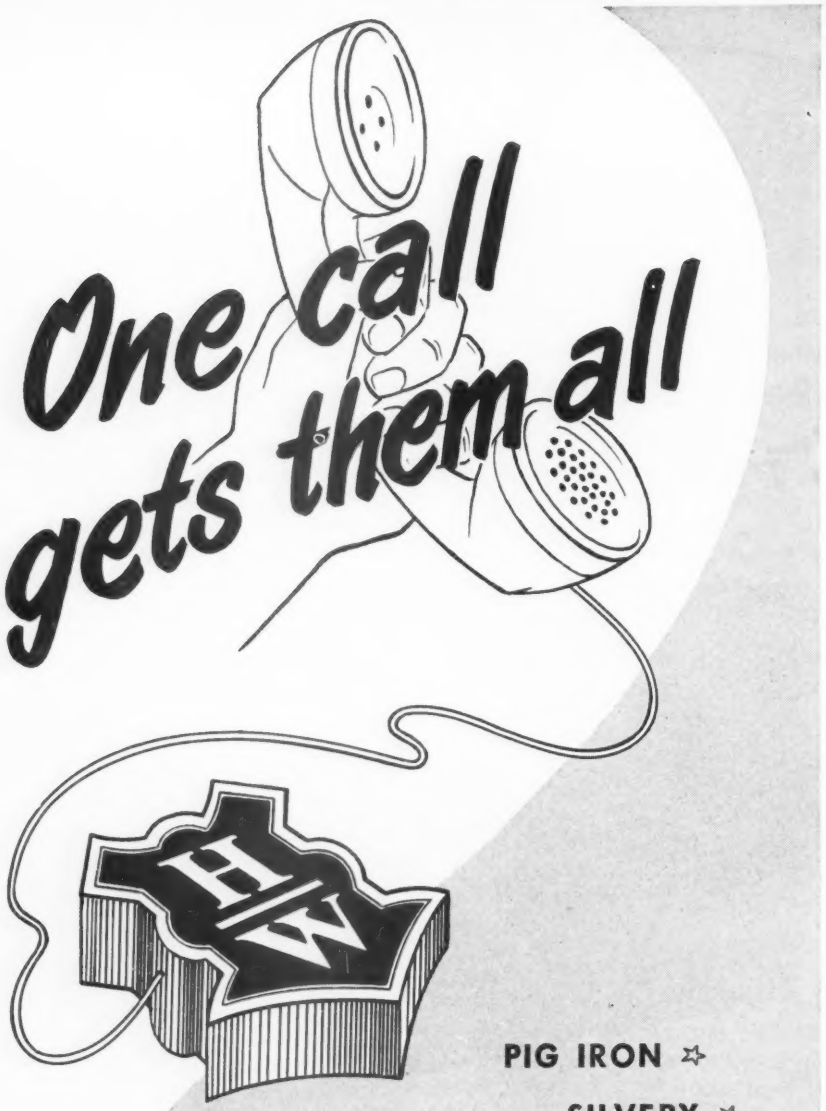
C-216



PIG IRON ✩
SILVERY ✩
FERROPHOSPHORUS ✩ SHOT ✩
GRIT ✩ SPIEGELEISEN ✩
LIMESTONE ✩ DOLOMITE ✩
REFRACTORIES ✩ COAL ✩
COKE ✩ FLUORSPAR ✩
SANDS ✩ CLAYS ✩

IN ANY QUANTITY

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(INCORPORATED)
CHICAGO · DETROIT · CINCINNATI · ST. LOUIS · NEW YORK
CLEVELAND · PHILADELPHIA · PITTSBURGH · INDIANAPOLIS
Established 1890

(*Concluded from page* 240)

trates from deposits in South Dakota's Black Hills area. Enlargement of facilities at the company's Metalloy Corp. Division, Minneapolis, for increasing production of lithium metal and compounds, also is planned at a cost of $175,000.

* * *

A new gray iron foundry has been constructed at 3350 Hollywood Ave., Beaumont, Tex., by Doug Connell, formerly of Mabry Foundry & Machine Co., Beaumont.

* * *

Grinding Wheel Institute, Greendale, Mass., and Abrasive Grain Association, Worcester, Mass., have changed their addresses to 2130 Keith Bldg., Cleveland 15.

* * *

Charles H. Besly & Co., 20 North Wacker Dr., Chicago, has changed its corporate name to Besly-Welles Corp. No changes in personnel or production facilities are involved.

* * *

Macklin Co., Jackson, Mich., manufacturer of grinding wheels, has completed an addition to its plant, permitting 35 per cent increase in production capacity.

* * *

Missouri Diecasting Co. has purchased a building at 1411 North Seventeenth St., St. Louis. The firm formerly owned property at 2312 Dickson St.

* * *

Crucible Steel Casting Corp., 2850 South Twentieth St., Milwaukee 7, suffered an estimated $40,000 fire loss in its main building Dec. 26.

* * *

Fire completely destroyed Cogswell Foundry & Machine Co., Highgate Center, Vt., Dec. 16.

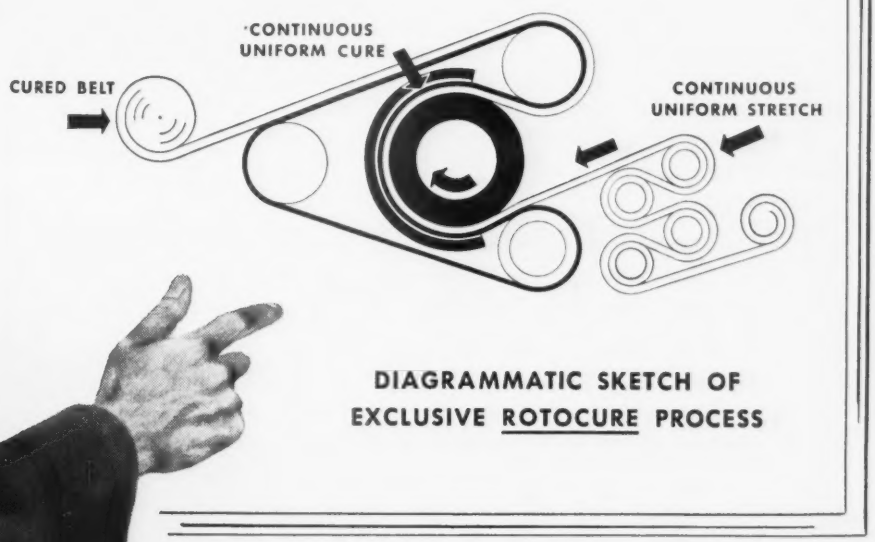
* * *

Prime Mover Co., Muscatine, Iowa, suffered extensive fire damage Dec. 12.

Instruments in Industry

A 50-page bulletin entitled *Proceedings of the First Annual Conference on Instrumentation for the Iron and Steel Industry* has been made available by Instruments Publishing Co., Pittsburgh 12, for $2. Conference was sponsored by Carnegie Institute of Technology and the Pittsburgh Section of the Instrument Society of America in co-operation with a number of other technical and scientific organizations. Bulletin contains 11 papers presented at the conference dealing with various types of instruments used for measurement and control.

Keep 'em Moving



DIAGRAMMATIC SKETCH OF
EXCLUSIVE ROTOCURE PROCESS

—that's how ROTOCURE prevents OCS*—Achilles Heel of Conventional Belts!

"Start and stop" vulcanization (the conventional flat press method) can bump conveyor belt costs way out of line due to short life and constant replacements. Here's why: Press overlaps are *unavoidable* in this method of belt manufacture. They *result in overcured segments that weaken the belt.*

Why Rotocure-made Belts Are Superior to Flat Press

The BWH—pioneered method of ROTOCURE is a continuous, endless curing process of uniform belt advancement. Every inch of the belt is subjected to *identical* curing—in amount and in time. Thus weak segments due to overlapping are eliminated automatically by the process itself.

Why Rotocured Belts Should be on Your Jobs

The weak segments you *don't get* in BWH conveyor belts mean you *do get:*

1. Increased belt flex life—up to 40%.
2. Elimination of mechanical distortion at the press ends.
3. Constant, uniform stretch.
4. Uniform, abrasion-resistant covers.

For years, it's been an established fact among users that BWH Rotocured belts are "tonnage producers." If *you* want longer belt life, a good size dip in belt maintenance costs and savings per ton in materials conveyed ask your BWH distributor. He *knows* who's buying the values! Or write us direct.

*Overcured Sections-present every 30′ to 40′ in all belts made by the flat press method. Only Rotocuring (continuous, non-stop curing) eliminates this major cause of belt failures.

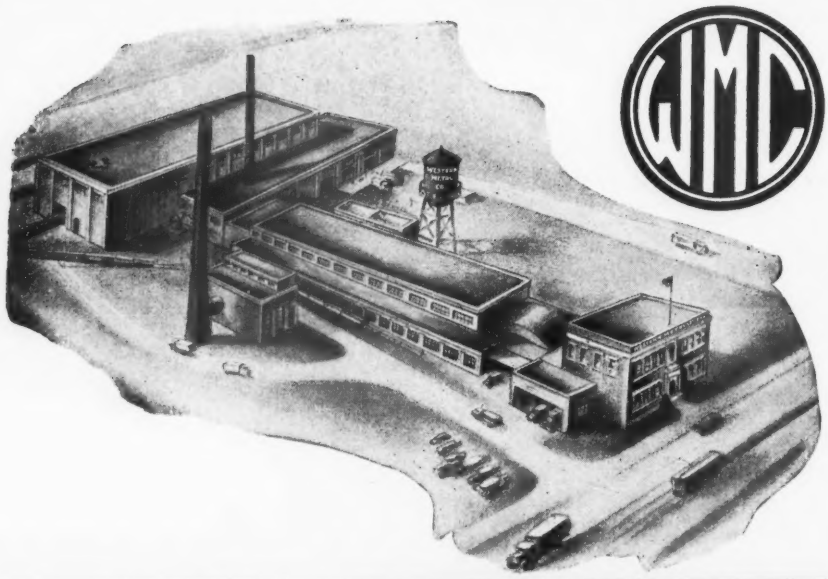
BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. · P. O. BOX 1071, BOSTON 3, MASS., U. S. A.



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We produce Brass, Bronze and Aluminum Ingots to your exact specification and can provide complete laboratory service as well as field metallurgists to help you produce the quality castings necessary to insure the standards of today's requirements. We have built our reputation on quality and service. . . . it will pay you to investigate Western.

WRITE FOR NEW BULLETIN "F"

Here in one booklet is a complete summary of tables including A.S.I.M., U. S. Federal, U. S. Navy and S.A.E. specifications as well as nonferrous ingot metal alloys for all various modern industrial classifications. This bulletin will be of utmost value to you as will an acquaintance with a truly reliable ingot manufacturer, for the successful operation of your foundry.

WESTERN METAL COMPANY
3201 SOUTH KEDZIE AVE. CHICAGO 23, ILLINOIS

SMELTERS AND REFINERS OF BRASS AND ALUMINUM INGOTS

Industrial Truck Group Elects Officers

Members of the Industrial Truck Association at their annual meeting in Hotel Statler, New York, Dec. 11, elected as their new president, Walter E. Schirmer, vice president, Clark Equipment Co., Buchanan, Mich. Prentice Borden, general manager, Crescent Truck Co., Lebanon, Pa., was named vice president.

William Van C. Brandt will continue as managing director of the association. Elected as directors for one-year terms were: J. A. Baldinger, J. R. Morrill, R. P. Williamson, A. L. Schuller, W. A. Meddick, F. J. Shepard Jr., O. T. Henkle, George E. Raymond Jr., H. S. Germond, L. A. DePolis, J. W. Wunsch, C. E. Smith and E. F. Twyman.

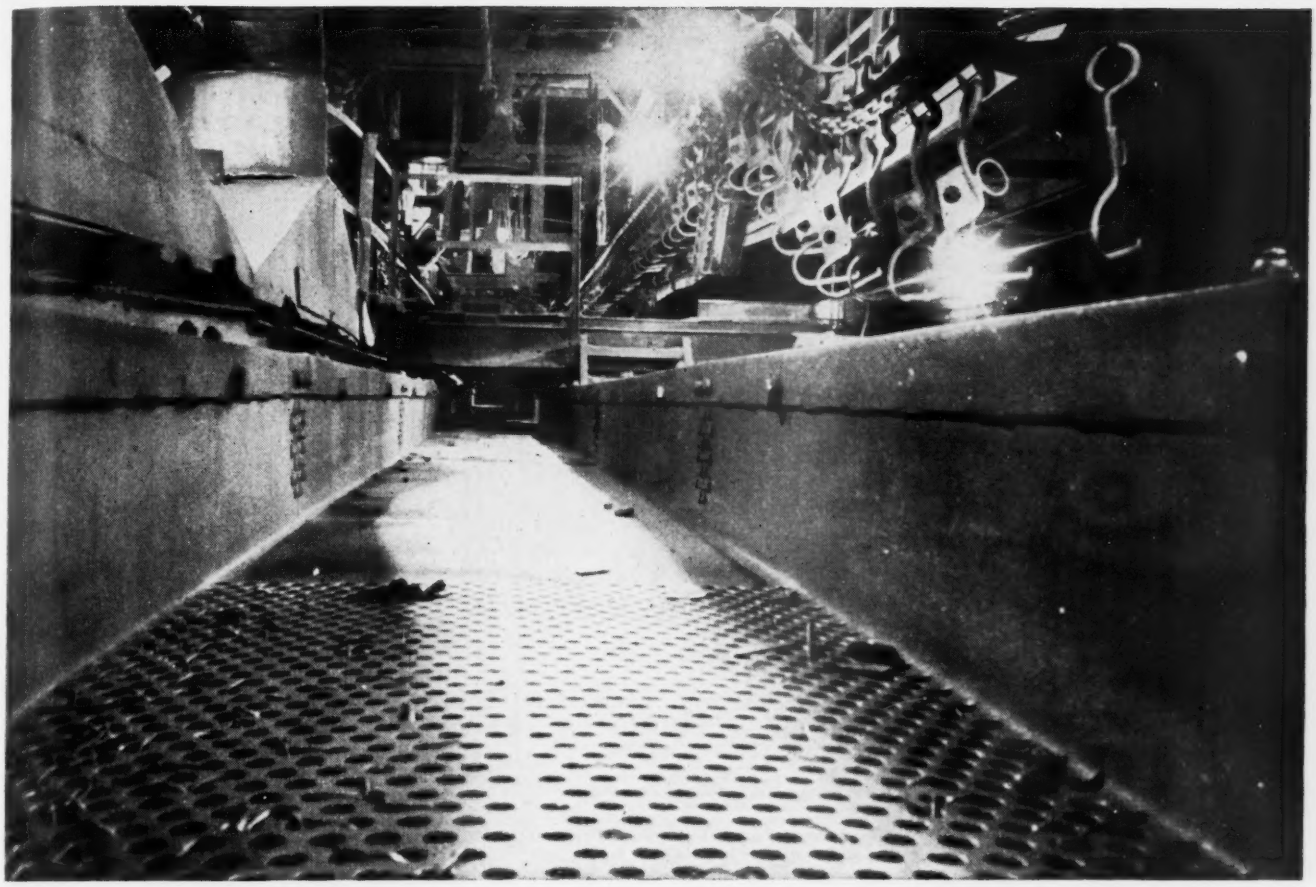
Book Review

Transactions of the International Foundry Congress (*Congres International De Fonderie, Bruxelles,* 1951); fabricoid; 516 pages 8 x 10 in.; $10. May be ordered from the Penton Publishing Co., Cleveland, or Penton Publishing Co. Ltd., 2 Caxton Street, S.W.1, London, England.

This volume contains the 42 papers either in French or English presented at the International Foundry Congress, in Brussels Sept. 10-16, 1951. Sixteen papers are in English and 26 in French with a summary in the alternative language in each case. The list includes official exchange papers from the American Foundrymen's Society, Association Technique de Fonderie de France, Association Technique de Fonderie de Belgique, Associazione Italiana de Metallurgia, Institute of British Foundrymen, Nederlandsche Vereeniging van Giertij-Technici, Sveriges Mekanforbund, Verein Deutscher Giessereifachleute. An index lists the author's names and the titles of their papers. A note on each item gives the number assigned to each paper on the program.

Federal Issues Catalog

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, recently published catalog 400 covering its complete line of foundry facings, supplies, and equipment. The 323-page, cloth-bound book lists company representatives and sales offices, pictures company facilities, describes and indexes all products, and contains a technical data section of useful information. Copies are available from Federal Foundry Supply Co. if requested on company letterhead.



3 Foundry Units replaced by this HEWITT-ROBINS VIBRATING CONVEYOR

"Absolute Minimum Maintenance And Down Time," Says Michigan Foundry Engineer!

"Since April 1951, when our Hewitt-Robins Vibra-Veyor replaced 3 foundry units, it has operated beneath 5 foundry shakeouts with absolute minimum maintenance and *down time*," states Mr. George Bobier, Plant Engineer, Wilson Foundry & Machine Company, Pontiac, Michigan.

Handles anything a belt conveyor can't! The Hewitt-Robins Vibra-Veyor® moves material . . . hot or cold, wet or dry, lump or pulverized . . . quickly, quietly at lowest cost-per-ton—on the horizontal, up-hill or down-hill to 10 degrees.

Won't lag on loads! Load the Vibra-Veyor to the top of the pan . . . give it multiple feeds along its entire length (up to 150') and it won't bog down. It can be started under full load. Has feeder action . . . spreads out surges.

Mechanically compensates overloads! The vibrating mechanism is full floating . . . two balanced pans with a single drive unit so arranged that one pan will compensate for overload on the other, with no additional load on the vibrator. Pan sections are supported on tough malleable iron rockers and soft coil springs.

Install it yourself! Your own men can do it . . . because there's no vibration in the base structure, no special foundation is needed . . . maintenance is simple, too, only 4 points to lubricate.

Get the whole story! Discover how a Hewitt-Robins Vibra-Veyor can help you. Write for Bulletin 135, Robins Conveyors Division, 240 Passaic Ave., Passaic, New Jersey.

A MECHANIZED FOUNDRY BENEFITS EVERYONE

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

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SEMET-SOLVAY FOUNDRY COKE

Are you always sure that your castings will have the composition, strength and Brinell required by your customers? Users of Semet-Solvay Foundry Coke have a wide margin of safety to compensate for the unpredictable variables which occur even in the best managed foundries.

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When You Think of *Aluminum*

WHATEVER YOUR CASTING PROBLEM may be —die cast—permanent mold or sand cast, specify S-G Aluminum Alloys. Every step in their production is checked constantly by skilled laboratory men using the most modern equipment available. Our facilities are available to help you solve your specific problems. Trouble-free production of quality castings doesn't just happen. The skill and know-how of diecaster or foundry is of prime importance. But the most skilled craftsmen must have the right type ingot.

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Cupro-Nickel Castings

(*Continued from page* 105)

treatment should be avoided, and hardening by tempering after casting, applied where lead contamination exists. Table VIII illustrates some recent results.

Progressively higher hardnesses are available in cupro-nickel compositions with increasing tin and nickel contents. When chill cast or heat treated, the hardness values are further increased. Fig. 8, taken from Wise's work[3], indicates that over 40 Rockwell C can be developed in an alloy containing 35 per cent nickel and 10 to 12 per cent tin when quenched and tempered.

Aluminum-Alloyed Cupro - Nickels —Aluminum is regarded as an undesirable impurity in the usual run of cupro-nickels. Actually, it increases the tensile and yield strengths smartly when properly handled. Foundrymen who are expert in handling the silicon bronzes might prefer to make the 1 per cent silicon alloyed cupro-nickel of Fig. 2 where comparable tensile properties are the essential requirement. In the aluminum-alloyed cupro-nickel, a tenacious aluminum oxide film forms at liquid metal temperatures. During the mold-filling operation there is always the risk to the inexpert, that the film will tear and fragments become entangled in the stream, ultimately becoming trapped in the solidifying casting.

Over the years, foundrymen have learned to handle aluminum bronzes which possess similar habits. Aluminum-alloyed cupro-nickels, therefore, offer no new problems to the foundryman experienced in casting aluminum bronzes. The copper-nickel-aluminum alloy (A in Table XII) represents an important development.

Alloy D is a typical sand cast complement to the wrought 90-10 cupro-nickel condenser tube alloy. Alloys C and B are progressively strengthened by increasing increments of iron, manganese and phosphorus. Alloy A is a high-strength structural and pressure casting type of alloy possessing a high resistance to corrosion and erosion in sea water exposures. Tests in sea water at 14 ft per second showed a weight loss in mg per sq dm per day of 20 for Cunikal D, and 140 for silicon bronze. Much more will be heard about this alloy as its performance and production becomes more broadly known.

A special aluminum alloyed cupro-nickel finds application in the glass industry mainly for heat-resistance purposes such as plungers, press-

(*Continued on page* 248)

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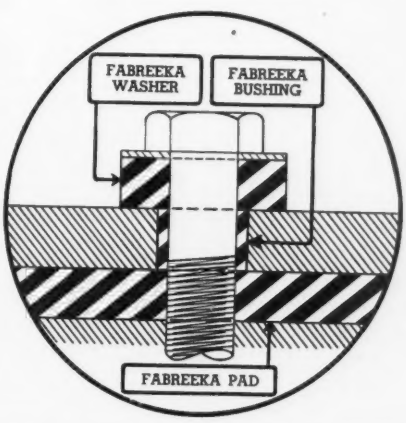

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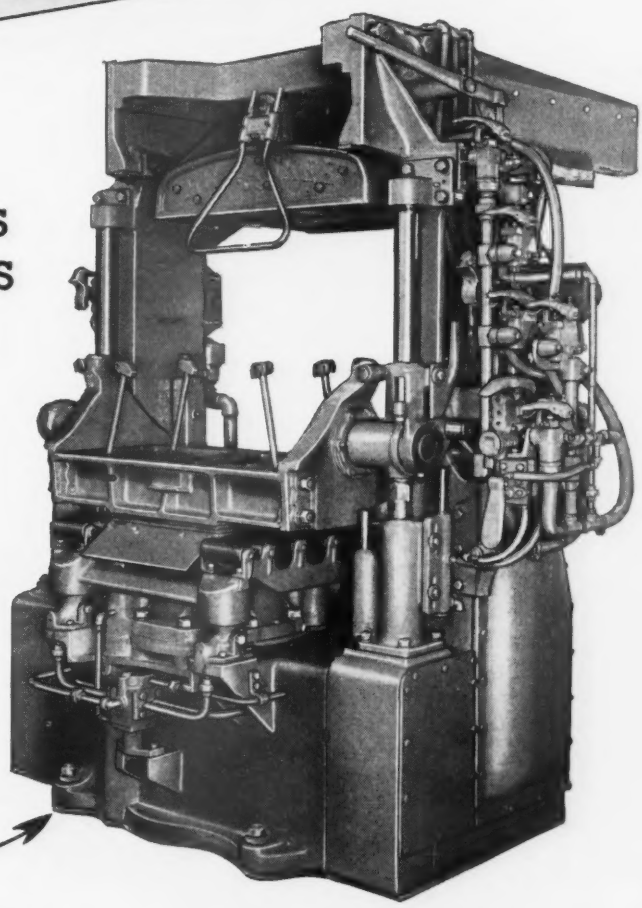

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(*Continued from page* 246)

molds and neck rings for bottle molds.

Occasionally it is used for corrosion resisting applications for such parts as acid trays (usually hydrofluoric acid) for the frosting of lamp bulbs. Since its mechanical properties are considered unimportant, some effort may be made to obtain maximum benefit from a lower temperature freezing alloy, viz: Cu 75-72, Ni 17-20, Si .35, Mn .10, Al 6-8, Fe .15; brinell hardness 210.

Corrosion Resistance — Corrosion resistance of a high order is to be expected of the cupro-nickels. In general, they excel the high-strength copper-base alloys and bronzes in corrosion resistance and these, in turn, excel the red brasses and leaded bronzes (Table X).

Cupro-nickels are scarcely affected by fresh water corrosion. A surface stain or tarnish marks the extent of the corrosion attack. They have been extensively used for their resistance to many mild corrosives such as food products and syrups in applications such as packaging and bottling equipment, pumps, valves, metering and conveying equipment.

Cupro-nickels have had a long and distinguished service in sea water corrosives. Condensers, pumps, valves, marine fittings, propeller shaft sleeves, and many similar applications have made cupro-nickel a seagoing material. Jet velocities and aeration may multiply the rate of attack 5 to 10 times that of the slow-motion corrosion of Table X, without disturbing the relative position of the alloys in the table. LaQue and Mason[4] have published a comprehensive compilation of corrosion rates for cupro-nickel in sea water and in industrial corrosives under various conditions.

Corrosion in the steam and water service systems of steam and electric power generating plants is easily resisted by the cupro-nickels. Thermal expansion and elevated temperature strength acquire increasing importance. Valve, pump, turbine and boiler accessories accentuate the need for resistance to erosion or galling. Consequently, the tin or silicon alloyed cupro nickels are used. Figs. 3 and 8 illustrate one of the basic reasons for their use (Fig. 5).

Elevated Temperature Properties— Mechanical properties are scarcely disturbed for temperatures up to 600° F for the ordinary 70-30 cupro-nickel alloy. Some judgment may need to be exercised in applications involving elevated temperature service, as to whether high temperature toughness is a more important property than high temperature strength. The wrought metal grades of cupro-nickel which possess a high toughness and are relatively free of hardening ingredients such as tin, silicon or aluminum, offer an index of available properties. Short time tests[5] on an 80-20 alloy show a substantial degree of toughness for temperatures up to 750°F, as shown in Table IX.

For a wrought 70-30 cupro-nickel alloy, the short-time strength and creep rates shown in Table XI have been reported.

Cupro-nickel of the normal 70-30 type in cast form is extensively used at ordinary temperatures for resistance to sea water, boiler water and condenser water corrosion, as well as for elevated temperature service involving the corresponding vapors or steam. A thermal expansion that approximates that of the cast irons or steels, and a low thermal conductivity, have made the alloy an important complement to the structural parts of valves, pumps and compressors which are subjected to heat, wear and corrosion.

The trend toward progressively higher steam temperatures and pressures brought about developments leading toward tin, silicon or aluminum hardened, erosion-resistant compositions. Of these compositions, the tin-alloyed cupro-nickels have been exceptionally successful for valve seat and trim where resistance to galling, wear, erosion and corrosion are encountered. It is not uncommon to mate a 4 per cent tin-alloyed cupro-nickel with an 8 per cent tin-alloyed type to obtain sufficiently different characteristics to avoid seizure or galling. Nickel contents up to 50 per cent, with tin contents of 8 to 10 per cent, provide a hard alloy suitable for heavy seating loads and possessing stability as well as resistance to erosion in steam for temperatures up to 850°F. Tables V and VII, and Figures 9, 10 and 11 illustrate some of the compositions and properties of cast alloys of this type.

Subnormal Temperatures — Cupro-nickels of the ordinary 10, 20 and 30 per cent nickel grades which are not hardened by silicon, aluminum or tin, and, therefore, possess a high toughness, make an excellent material for service at subnormal temperatures. Tests at temperatures down to minus 320°F on the wrought and welded

(*Continued on page* 250)

TABLE VIII—Damage to Hardness and Microstructure by Lead

	Alloy No. 1	Alloy No. 2
Copper	65.2	Bal.
Nickel	23	25
Tin	9.32	9
Lead	.13	None
Zinc	1.22	1.0
Iron	.88	..
Silicon	.29	..

Brinell Hardness and Heat Treatment

	Alloy No. 1
As cast	187
1500° F 4 hr, water quenched	116
Same as above plus: reheated 875° F—4 hr	270*
	Alloy No. 2
As cast	179
1600° F 5 hr, water quenched	120
Same as above plus: reheated 750° F—5 hr	304
Same as above plus: reheated 750° F—8 hr	310

* Exhibited microscopic quench-cracks

TABLE IX—Short Time Hot Strength of 80-20 Cupro-Nickel

° C	° F	Tensile Stgth, psi	Elongation, %
15	60	59,500	21.4
200	392	53,000	17.1
400	752	46,000	16.1
600	1112	36,200	13.1

TABLE X—Typical Sea Water Corrosion Rates

(Aerated Sea Water Immersion—60° F)

Alloy	Cu	Ni	Sn	Zn	Fe	Al	Corrosion Rate, Ipy*
Cupro nickel—tin	67.2	22.5	7.6	1.85	.56	...	.0002
Aluminum bronze	85.4	...	...	...	3.10	10.6	.0005
Phosphor bronze	88.0	...	11.4	...	...	...	.0020

* Ipy=inches penetration per year.

TABLE XI—Creep and Hot Strength of 70-30 Cupro-Nickel Alloy

Temperature, ° F	Short Time Tens. Stg'th., psi	Elongation, %	Creep Rate—1% per 10,000 hr, psi	Creep Rate—1% per 10,000 hr, psi
85	64,700	37	.....	....
750	47,350	23	18,800	9,100

TABLE XII—Composition and Mechanical Properties of Some Aluminum-Alloyed Cupro-Nickels

	Cu	Ni	Fe	Mn	Al	Si	Deoxidizer	P	Tensile Strength, psi	Yield Strength, psi	Elongation, %	Bhn	Pouring Temp., ° F
Cunikal A	Bal.	12	.60	1.0	1.5	.10	P + Ti + CaSi	.05	85–95,000	60–70,000	7–13	200–220	2500
Cunikal B	Bal.	12	1.20	1.0	..	.10	Si	.03	48,000	24,000	30	90	2400
Cunikal C	Bal.	12	.75	.50	..	.10	Si + P	.50	53,000	30,000	32	104	2300
Cunikal D	Bal.	12	.50	.50	..	.10	Si	...	38,000	13,000	48	65	2300

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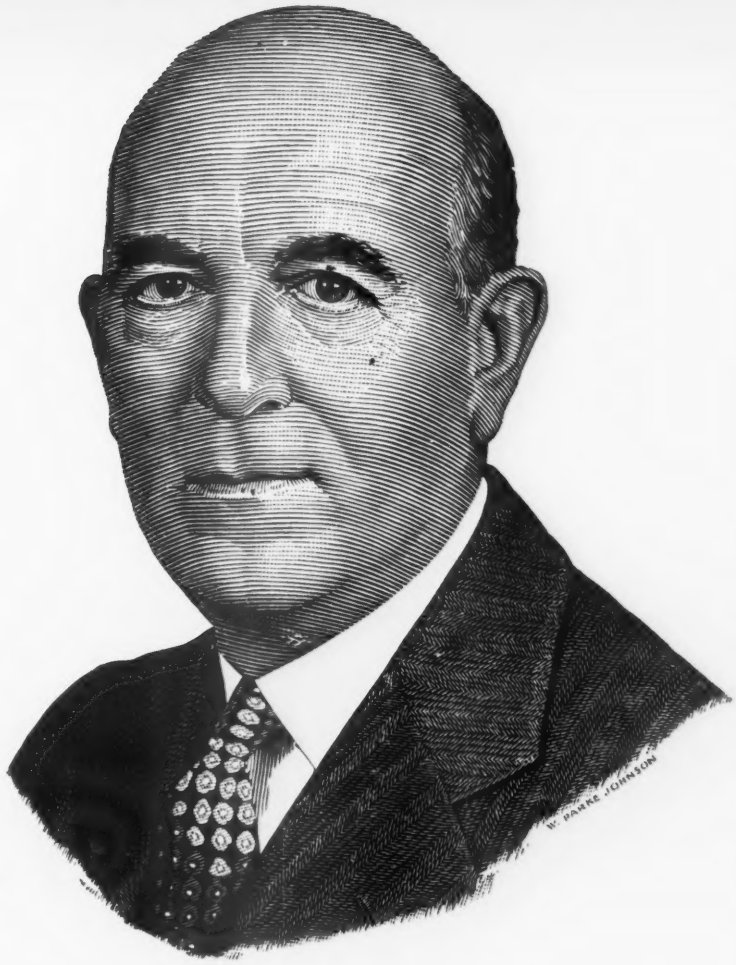

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(*Continued from page* 248)

metal, indicate that the mechanical properties of the material are practically unaffected. Similar results should be expected of castings made to the same degree of purity as the wrought metal.

The absence of tin in the composition is considered helpful because metallic tin[6] is known to decompose at low temperatures, and tin-alloyed products such as the bronzes, are consequently regarded with corresponding suspicion.

Refrigeration equipment and machinery exposed to very cold climatic conditions would be expected to perform well in the cupro-nickel compositions of the type mentioned for welded or brazed usage.

Electrical Resistance—One of the by-products of a solid solution alloy such as is provided in a pure blend of copper and nickel, free from other ingredients, is a progressive increase in electrical resistance with increasing nickel content. This effect is at once simple in calculation as well as in application. In the range of 10 to 60 per cent nickel, each increment of nickel content produces a corresponding increase in electrical resistance (Fig. 15). For 10 per cent nickel, Fig. 12 shows about 10 michroms per CM3 resistance. For 50 per cent nickel, the value is about 50. From such simple relationships the electrical engineer may select a copper-nickel alloy that will fill his needs for certain electrical properties.

The temperature coefficient approaching zero over the 10 to 60 per cent nickel range makes the material more desirable. Cast resistance grids and similar parts have been made of alloys in this copper-nickel range. They are exceedingly useful to the electrical industry[7]. Special compositions in wrought shapes are frequently needed in quantities that are too small for rolling mill processing. In such cases the foundry can cast ingots or slabs or rings which can subsequently be forged into necessary parts. Rotor end connectors for electric motors are an example of this type of product.

Welding, Brazing and Soldering — Cupro - nickel castings specifically made for the purpose, can be welded, brazed or soldered in accordance with prescribed practice. Filler-metal used in welding is customarily a high-purity product which, in the course of manufacture, has to a considerable extent already passed the qualifying requirements of possessing high ductility, both hot and cold, when rolled and drawn. In addition, competent producers will assure

themselves of good weldability and freedom from contaminants in metal and flux, by checks with either streak or bead tests. Metal and fluxes will be of sufficient purity to deliver a deposit containing less than .005 per cent each of contaminants such as sulphur, phosphorus and lead.

Similar comments apply to brazing metals or silver solders which are usually alloys of silver, zinc, cadmium, nickel and copper, with practically no tin or lead and a negligible amount of residuals or contaminants.

The chance of damage from lead contamination is apparent because welding and brazing operations occur at temperatures above 600°F where lead is liquid and since it is insoluble, it invites the risk of developing cracks. During welding or brazing, the metal may be subjected to thermal or mechanical stresses or combinations of the two, and a high order of toughness is necessary.

Require Special Treatment

Castings which are to be welded, brazed or silver soldered, usually require special preparation. A high degree of toughness, both hot and cold, is desirable. Wrought metal purity and melting practice are required. Freedom from gas pick-up in melting or from vapor generated in the mold, is essential. Complete deoxidation to a "killed" condition is necessary to avoid risk of gas exudation when heating for "joining." Virgin metal melting avoids the risk of infecting the metal with unanticipated contaminants. Impurities or nonmetallics which are reactive at welding or brazing temperatures, should be eliminated or kept at very low levels. Carbon and sulphur should be under .10 and .01 per cent, respectively. Silicon at .10 per cent and lead below .01 per cent are similar requirements. Other elements that may form intergranular films that melt at low temperatures, need to be avoided. Phosphorus is an element of this type, and tin may contribute if ingredients such as phosphorus are available to combine with it.

Weldable cupro-nickels are preferably low-silicon type which possess maximum ductility (see Fig. 2), viz: Cu balance, Ni 10-30, Fe 1.25, Si .10, Cn .50, C .10. Aluminum, lead, zinc, tin, sulphur and phosphorus should be as low as possible.

In some cases, zinc-containing alloys of the nickel-silver type are preferred for their lower fusion temperatures, the self-purging and fusion protecting characteristics of zinc oxide vapor, and greater compatability with the brazing material in the case of silver solders. The same vig-

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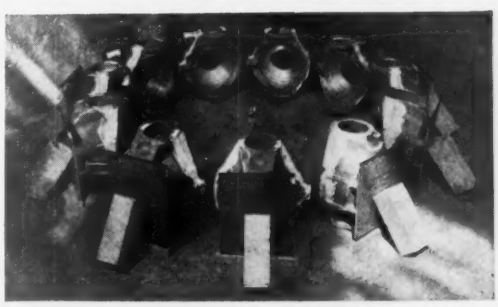
1946— 150 steel foundries rented or leased radium.

1947— American Society for Testing Materials issued Radiographic Standards for Steel Castings. (Gamma Ray). E71-47T.

1948— 200 steel foundries rented or leased radium.

1949— Revision of the U. S. Navy Universal Exposure Calculator for Radium Radiography by N. A. Kahn, E. A. Imbembo and J. Bland, New York Naval Shipyard, Brooklyn, N. Y.

1950— 250 steel foundries rented or leased radium.



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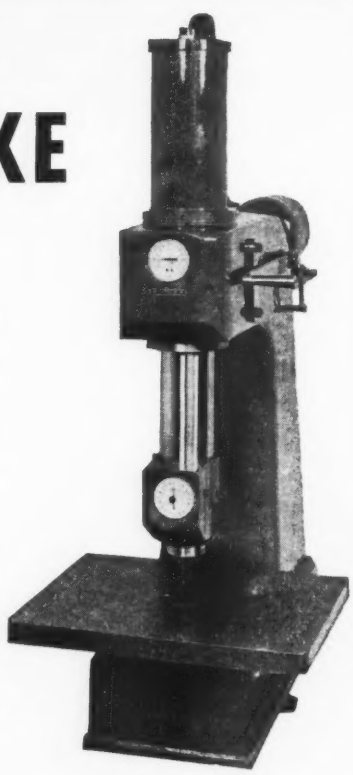

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ilance against contamination from lead and other impurities is practiced. A typical alloy would contain 20 per cent nickel, 20 per cent zinc, balance copper.

Uses—The uses (Fig. 4) to which the cupro-nickels are put are many and varied. Primarily a corrosion-resisting material, it is common to find them in pump, valve, meter and liquid handling mechanisms. A high resistance to sea water corrosion duplicates these applications and extends them to propeller sleeve, rudder parts, marine fittings and trim and the power plant.

Elevated temperature strength and resistance to erosion and galling open a path for their use in the power and chemical industries for pump and valve parts, boiler specialties, power plant accessories, condenser fittings, turbine seal rings, bushings and glands.

The electrical industry finds it useful for its unique electrical characteristics and for its durability in turbine parts and power generating accessories (Fig. 13).

Higher stiffness and strength, along with correspondingly high corrosion resistance, has prepared the way for the use of centrifugally cast tubes as suction rolls in the paper industry, or propeller shaft sleeves in shipbuilding work.

High strength and toughness, a pleasing appearance, and resistance to fruit juices, syrups, fermented foods and food by-products make them useful for food-processing, packaging, conveying and dispensing equipment (Fig. 14). Juice extractors, shredders, mixers, filters and presses are common applications for this alloy (Fig. 6). Ice cream mixers, scrapers, creamery and dairy machinery provide additional uses for the cupro-nickels. Soda fountain, cafeteria and restaurant fittings also come in for cupro-nickel applications (Fig. 7).

Acknowledgements—The published work of my associates, Messrs. Kihlgren, Wise and Eash, and Frank Hudson of the Mond Nickel Co. Ltd., London, has been integrated into this composition. In addition, unpublished experimental work by Messrs. R. A. Kozlik and G. Lee of the International Nickel Co.'s Bayonne, N. J., Research Laboratory, has been added to complete a more comprehensive outline of the cupro-nickel alloys.

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Solidification of Metals

(*Continued from page* 93)

surface region of the casting, this heat is rapidly replaced by heat from the casting interior and only mild gradients can exist within the solidifying alloy. Since the degree of progressive wall growth in a given alloy is proportional to the steepness of the gradients, a high conductivity alloy is not readily amenable to pronounced progressive solidification. When the alloy has low conductivity, heat flow within the solidifying metal is sluggish and the heat removed from the casting surface by the mold at the beginning of solidifation is not replaced rapidly. As a result, steep gradients are formed and maintained throughout the solidification cycle and wall growth is of a more progressive nature.

Another factor affecting the mode of solidification is the temperature at which solidification occurs. The steepness of the gradients which can be established in a solidifying metal are a function of the temperature differential between the mold and solidifying metal. Obviously if the solidification temperature is only a few hundred degrees higher than the mold, steep gradients and strong progressive solidification are not possible even though the other properties are favorable. The effects of high and low solidification temperatures are illustrated schematically in Fig. 6D. The temperature of solidification also limits the heat capacity of a mold. In storing heat, a mold must rise in temperature but the extent to which the mold temperature can rise is limited by the temperature of the solidifying metal. Heating the mold has the same effect as lowered solidification temperature.

While the foregoing discussion of thermal variables was confined to their effect on the mode of solidification, these same variables also influence rates of solidification. For a given alloy, the steeper the gradients within the alloy the faster it will solidify, but a given gradient in an alloy having high thermal conductivity will indicate faster heat flow and

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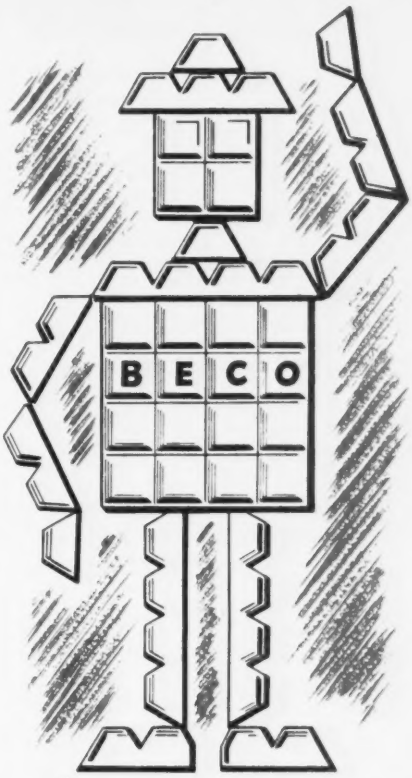

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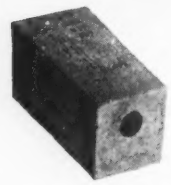

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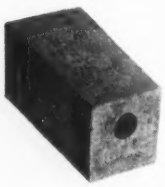

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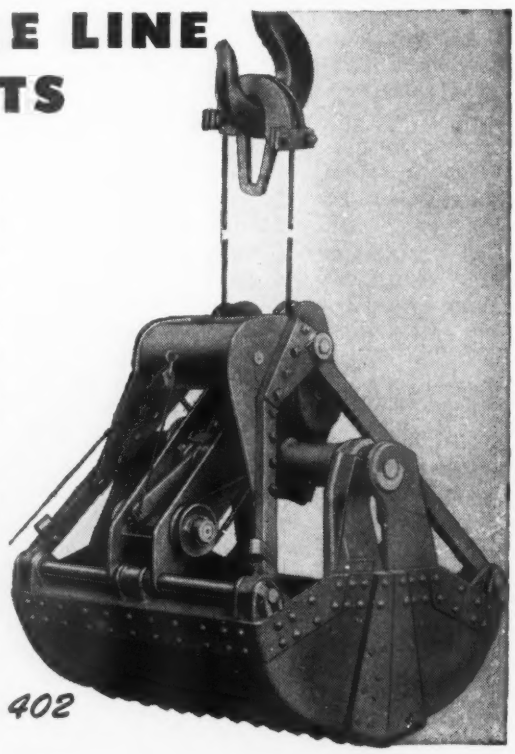

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hence faster solidification than the same gradient in an alloy having low conductivity. An alloy having high heat of fusion and high specific heat must evolve more heat than an alloy having low heat of fusion and low specific heat in order to produce like amounts of solidification.

It is apparent from the foregoing considerations that the mechanism of solidification of metals and alloys is the result of a complex interplay of many factors. While it is possible to deduce the type and rate of solidification which will be obtained for a given set of conditions the information will be at best only qualitative. Formal, quantitative data for the most important commercial alloys would be highly desirable. Such data may be placed into practical use by foundrymen roughly in the same manner that the classical "S" or Time-Temp-Transformation Mode curves of solid state steel transformation are used by the heat treater, i.e., as guides to interpret and control the transformation process. Such data have been assembled—the methods used and the resulting Thickness-Time-Transformation Mode curves for solidification are presented in the sections which follow.

Determination of TTT Curves—To date solidification TTT data have been determined for steels of low, intermediate and high carbon contents, tin bronze, aluminum of 99 per cent purity, and gray iron. Except for gray iron, data have been obtained for both sand and chill wall solidification.

The pertinent properties of the mold materials and alloys are listed in Table 1. These constants have been transposed from weight to volumetric terms to eliminate density complications. The test castings used to study solidification were of square cross section, 20 inches high, tapering from 7¼ inches square at the top to 6¾ inches square at the bottom. The chill mold castings were surrounded on the four vertical sides by gray iron chills having a thickness of 2½ inches. The sand mold castings were made in a synthetically bonded sand of AFS fineness No. 80, containing 3 per cent bentonite, 1½ per cent dextrine, ½ per cent cereal binder and 3½ per cent water. Feeding of the chill castings was provided by risers 7 inches in diameter and 12 inches high while risers on the sand castings were 9 inches in diameter and 12 inches high. All castings were bottom gated through a sprue molded in a separate flask.

Fig. 7 shows the gating arrangement and details of the thermocouple and recorder assembly of a test mold.

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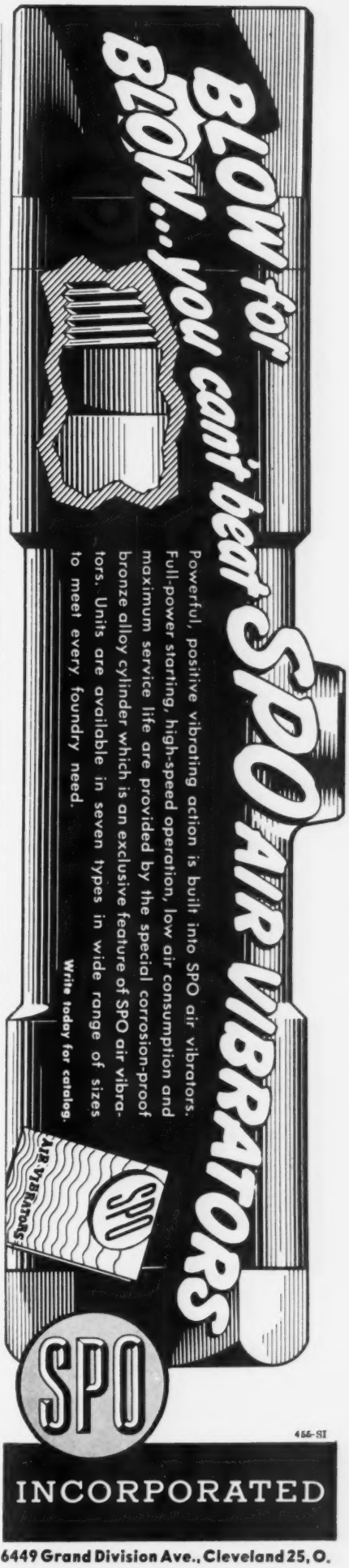
Thermal analyses were based on temperatures measured across both the casting and the mold in a plane at the mid-height of the casting where the cross section was 7 x 7 inches. At this location, riser and end gradients were negligible and solidification could be considered strictly lateral, i.e., as growth of solid only in a direction perpendicular to the vertical mold surface such as illustrated in Fig. 5. Experimental details have been reported in the various references provided previously.

Solidification of Steel — Thermal gradients were measured in steels containing approximately .08, .25 and .60 per cent carbon which solidify over a temperature range of approximately 40, 75 and 125° F, respectively. Fig. 8 shows typical cooling curves as recorded by the couples in the solidifying steel and in the sand and chill molds. It may be noted from these curves that a temperature inversion of the chill interface couple occurs approximately one minute after pouring due to the formation of an air gap. At this time the rate of heat flow across the interface is suddenly reduced, causing the chill interface temperature to drop and then later to rise. This phenomenon is evident to a more or less degree in all chill castings. The characteristics of the thermal disturbance, however, vary with the chill thickness and the type of alloy.[2]

Data of the type shown in Fig. 8 are replotted to show the gradients present in the three steels and the sand and chill molds at various intervals after casting (Fig. 10). These curves illustrate more clearly the marked differences of the gradient conditions in both the metal and the mold when the mold material is changed from sand with low heat transfer properties to chill with high heat transfer properties. Within a minute after pouring the sand near the casting surface is heated to very near the temperature of the metal, i.e., over 2500° F, while the sand only 4 inches away from the casting has been heated to a temperature of only about 200° F after 50 minutes, at which time solidification is complete.

In the chill molds the heat is removed from the chill interfaces so rapidly that the interfaces never exceed a temperature of about 1250° F. However, the entire chill volumes become rapidly heated during the solidification process, as can be noted by the fact that their outer surfaces attain temperatures of about 600° F within 4 minutes after pouring. As a result of the differences in mold properties steep gradients are present in the chilled castings and mild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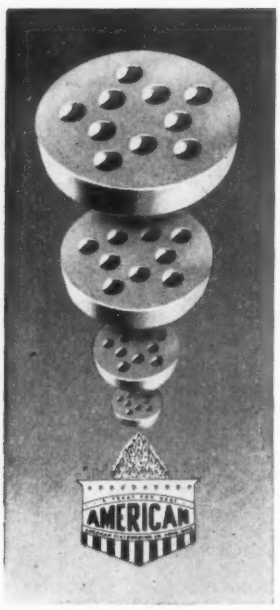

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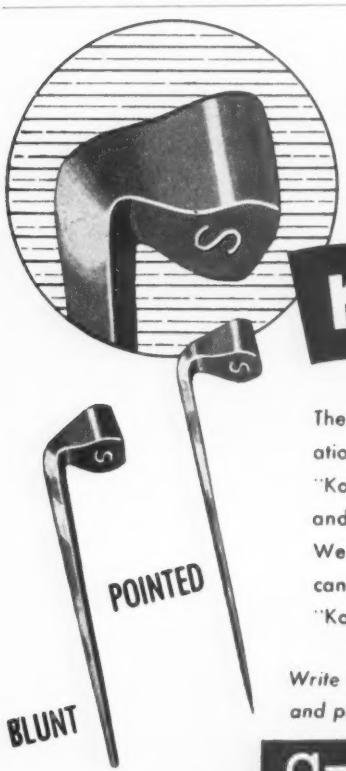

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gradients are present in the sand castings. The progression of the "start" and "end of freeze" waves of the various steel castings as deduced from the gradient curves are shown in Fig. 9 in graphic TTT fashion and in schematic form.

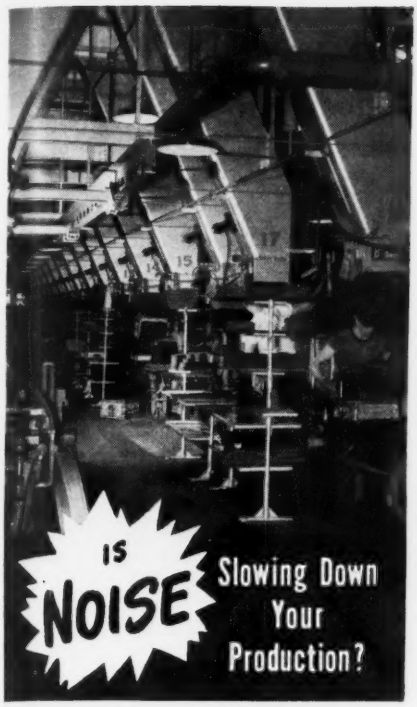
These data illustrate the effects of variations in solidification range and solidus temperature upon the nature of solidification. It may be observed from the series cast in sand molds that the low-carbon steel, which has the narrowest solidification range, solidifies in a highly progressive fashion. In this steel the "end of freeze" wave follows closely behind the "start of freeze" wave and only a short mushy region exists within the section. Solidification is less progressive in the medium-carbon steel, as can be noted by the greater space separation between the two curves.

Freezing Influenced by Carbon

The high-carbon steel, which has the widest liquidus to solidus temperature range, shows poor progressive solidification; it can be noted that the "start of freeze" wave traverses the entire section before the "end of freeze" wave starts. This means that for a short interval (23 to 29 minutes) the entire section consists of intermixed liquid and solid, and to obtain a sound casting liquid metal must flow laterally over the entire section to accomplish interdendritic feeding.

From these illustrations it would appear that the ease of feeding should be inversely proportional to the carbon content since the center of the low carbon steel casting remains liquid for a longer period of time and the distance over which lateral interdendritic feeding must occur is shorter than in the high-carbon steels. This was found to be true in a study of the feeding of plate sections[1] where a 2-inch-thick plate made with an .08 per cent carbon steel could be fed to complete soundness for a distance of 16 inches while a plate of the same length made of a .25 per cent carbon steel contained severe shrinkage.

The mode of solidification of the three carbon steels cast in chill molds, as indicated in Fig. 9, shows that chilling not only increases the rate of solidification four to five fold, but also alters the mode of solidification of steels particularly at the high carbon levels. The mode of solidification of the low carbon steel is but little affected by the use of chills, since its solidification mode, even in sand, is highly progressive. The use of chills on the .25 and .60 carbon steels, however, changes solidification



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characteristics to the more progressive nature inherent in the low carbon steels by maintaining a completely liquid casting interior for a comparatively longer time and reducing the width of the mushy zone so that interdendritic feeding need occur for only short distances through well tapered channels.

Variations in mold thickness and pouring temperature were found to have a minor affect on the rate and mode of solidification of steel sections; detailed data of these effects have been presented in a previous paper[2].

While the TTT curves and the schematic representation of solidification in the medium and high carbon sand cast steels indicate that solidification is of a poorly progressive nature, it will be shown that these steels, because of their high freezing temperatures and low conductivities, solidify with much more progressiveness than do the nonferrous metals. Because of this fact steel castings can be more easily fed to complete soundness than aluminum or bronze castings.

Fig. 11 is presented as evidence of the reliability of the thermal analysis technique for solidification studies. Nitrogen under pressure of approximately one atmosphere was applied through a permeable plug to a .60 per cent steel casting at a time (40 minutes) when thermal analysis data indicated a condition of approximately 1 inch solid skin, with the remainder of the casting in a mushy condition. The interdendritic liquid was ejected and, as indicated by the radiograph of a thin slice taken through the casting section, the predictions of thermal analysis are fully corroborated. Similar experiments have been conducted on other metals with the same excellent checks being obtained.

Solidification of Aluminum—Thermal data and TTT curves for aluminum of 99 per cent purity cast into sand and chill molds are shown in Fig. 12. This metal, because of the small amount of alloy it contains, solidifies over a temperature range of only 10° F which, as illustrated in Fig. 6B, would be conducive to progressive solidification. Aluminum, however, has high thermal conductivity and a low solidus temperature, both of which are detrimental to progressive solidification, as illustrated by Figs. 6C and 6D. The latter properties are most potent in this case and cause aluminum in sand molds to solidify with only slight surface to center gradients.

Ruddle and Mincher[5] have also observed a low degree of progressive

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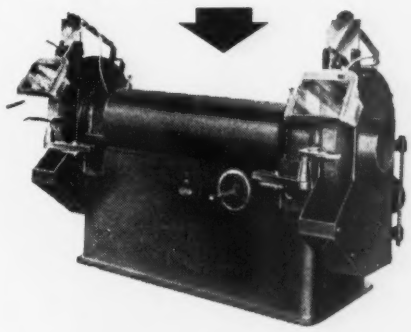

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solidification in aluminum. It is apparent from Fig. 12 that aluminum starts to freeze at the center within a few minutes after freezing begins at the surface. Thereafter for a period of about 40 minutes solidification consists of the thickening of the dendrite skeletons and freezing is finally completed at both the surface and the center within an interval of a few minutes.

Chills, as compared to sand, have a most drastic effect on both the nature and rate of solidification of aluminum. Because of their greater heat storage capacity and conductivity, chills not only decrease the solidification time from 50 to 4 minutes, but cause solidification to revert to a highly progressive pattern. The chill cast aluminum solidifies very nearly by the growth of a completely solid wall directly into liquid metal, and the mushy region becomes almost nonexistent. It is evident that lateral feeding in sand cast aluminum in the late stages of solidification is extremely difficult; consequently, interdendritic pools of liquid become isolated from feed metal and upon solidifying leave minute shrinkage voids.

Knowing the gradient conditions in sand and chill cast aluminum as it solidifies it is not surprising that interdendritic porosity is a great problem in aluminum sand castings or that this problem is so easily overcome by the use of chills. It is probable that the extreme susceptibility of sand cast aluminum alloys to interdendritic porosity is the cause of inferior mechanical properties of sand castings compared to chill or die castings.

Solidification of Bronze—Thermal data and TTT curves for tin bronze are presented in Fig. 13. The thermal behavior of tin bronze is very similar to that of aluminum. Sand cast bronze solidifies almost uniformly throughout the entire section and chills are required to bring about a wave like progression of surface to center freezing.

The aluminum and bronze alloys, however, represent two extremes of liquidus to solidus temperature ranges (10° F and 250° F, respectively) which is a factor in the solidification characteristics of these alloys in chill molds. The "start" and "end of freeze" fronts are displaced by greater distances in the chill cast bronze, and solidification is only moderately progressive compared to that of the chill cast aluminum. The length of the solidification range, however, has no effect on the mode of solidification of these alloys against sand walls because both alloys have such high conductivity as compared to sand that the entire sections cool without appreciable gradients.

As with aluminum, bronze cast in sand is prone to interdendritic porosity which often leads to leakers in bronze pressure castings. Even though the bronze cast against chills has a comparatively wide mushy zone the interdendritic channels are tapered sufficiently to allow easy lateral feeding.

From a consideration of the schematic representations of solidification of the various alloys described thus far, it is noted that in the bronze and aluminum sand castings liquid metal exists at the casting surfaces until the last few minutes of solidification. The presence of liquid metal at the surface prevents the metal skin from acquiring any measure of strength, and when gross shrinkage forms in these alloys it is usually external because the casting surface is easily punctured by atmospheric pressure. The steels, however, develop a completely solid skin prior to the formation of a shrinkage cavity and are thus able to withstand the force of atmospheric pressure — inasmuch as the skin is not punctured shrinkage remains internal.

Solidification of Gray Iron—Thermal data and TTT curves for gray iron are presented in Fig. 14. Gray iron is metallurgically more complex than the previously described alloys and as a result has solidification characteristics unlike the others. Gray iron in effect must pass through two cycles of solidification, the first when austenite dendrite growth occurs, and the second when the eutectic solidifies. Each of these cycles has "start" and "end of freeze" waves. While gray iron has low thermal conductivity it also has a wide solidification

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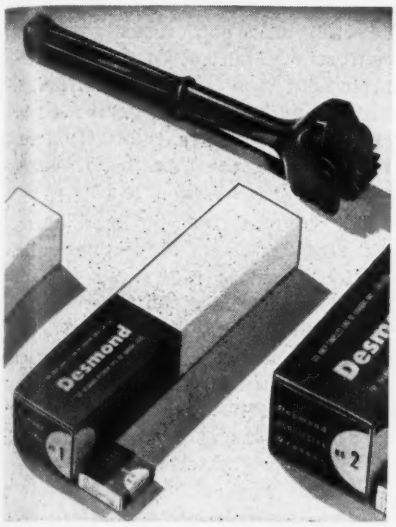

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range, high latent heat, and a moderately low solidus temperature—all of which result in a solidification mode which is only slightly progressive, and which exhibits characteristics midway between those of steel and the nonferrous alloys. Although the casting does not become completely solid until 106 minutes after pouring, it will be noted that solid begins to form at the casting centerline within 11 minutes after pouring.

For approximately the first half of the freezing cycle solidification of gray iron consists primarily of thickening of the dendritic arms and it is not until approximately 60 minutes after pouring that there is a completely solid skin at the surface. Because of the absence of significant surface-to-center gradients the interdendritic channels are of fairly uniform thickness, extending over the entire cross section, and by the time a solid skin has formed, these channels have become very narrow. Such conditions make interdendritic feeding difficult, and were it not for the fact that the late graphite formation, with its resultant volume expansion, makes late feeding unnecessary, it would be difficult to feed gray iron to soundness.

Comparison of Solidification Times—The relative effectiveness of chill and sand walls upon the solidification rates of the various alloys is indicated by a comparison of the solidification times shown in Table II. It can be noted that in sand molds steel solidifies more rapidly than the other metals while in chill molds its solidification is slower. This apparently anomalous behavior is explainable by consideration of (1) the relative solidification temperatures and thermal conductivities of steel and nonferrous metals, and (2) the thermal properties of sand and chill molds.

The more rapid solidification of steel in sand molds is attributed primarily to its higher solidification temperature, and secondarily to its comparatively narrow solidification range. In considering the effect of solidification range it should be noted that wide solidification ranges necessitate the removal of additional amounts of liquid and solid specific heat concurrently with the removal of heat of fusion, thus tending to prolong the solidification process.

The limited effect of solidification range may be deduced from the fact that there is only a 14 per cent (42-48 minute) increase in solidification time between the .08 and .60 per cent carbon steels (Fig. 9), despite the more than threefold difference in width of the solidification ranges

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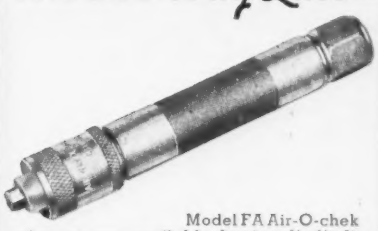

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(40° F and 125° F, respectively). Thus, the difference in solidification range between steel and the nonferrous metals must be considered to play a secondary role in determining solidification time.

The temperature of solidification is of primary importance to solidification rate inasmuch as this factor determines the rate of heat transfer through the sand. Differences of thermal conductivity of the solidifying metals are of minor importance in sand molds because the relatively low heat conductivity of the sand provides a valve-like action to heat flow. The higher solidification temperature of the steels causes a more rapid rate of heat removal from the casting, as indicated by the faster rate of heat travel through the sand. For example, at 60 minutes after pouring, the sand around the low-carbon steel casting (Fig. 10) is above 212° F for a distance of 4 inches from the interface, but at this same time the sand around the bronze (Fig. 13) which freezes at a lower temperature, has been heated above 212° F for a distance of only about 3¼ inches from the interface.

In the case of chill castings the mold wall thermal conductivity is more closely the same as that of the solidifying metal, and accordingly variations in thermal conductivity of solidifying metal become an important variable affecting solidification times. Since aluminum and bronze have considerably higher thermal conductivity than steel, heat is transferred to the chill at much faster rates. This is clearly indicated by the much smaller temperature gap between the casting and chill interfaces that is developed in the case of the nonferrous metals (compare Figs. 13 and 10).

The potency of this effect is further evidenced by the fact that the mold interface temperature is actually higher for the bronze casting than the steel despite the considerably higher solidification temperature of the steel, and by the more pronounced thermal gradients in the solidified steel skin. The lower temperatures in the surface metal associated with steep gradients necessarily require that specific heat of the solid surface metal must be removed concurrently with extraction of heat of fusion.

It will be noted in Fig. 10, for example, that the steel casting surfaces cool as much as 600°F below the solidus temperature before freezing ends at the center, and inasmuch as the volumetric specific heat of steel is comparatively high, a considerable amount of additional heat must be removed by the chill. In contrast, the solidified skin surfaces of the chill cast nonferrous alloys remain near solidification temperatures throughout the entire solidification process and specific heat removed below the solidus is a relatively small component of the total heat evolved during solidification.

The complex interplay of the various factors which determine solidification rates is illustrated by consideration of the solidification times of aluminum and high-carbon steel. Aluminum has a very low solidification temperature which tends to prolong the solidification time, and low heat constants and a very short solidification range which tends to shorten solidification time. High-carbon steel, on the other hand, has high heat constants and a wider solidification range which tend to prolong the solidification time and a high freezing temperature which acts to accelerate solidification. Each combination of properties results in very nearly the same end-time of solidification when the two metals are cast in sand molds.

FOUNDRY Index Ready

Index to FOUNDRY, Volume 79, listing by title, subject matter and author the editorial material published during 1951, is available for distribution. Subscribers may obtain copies on request.

The potent effect of solidification temperature is clearly illustrated by comparison of gray iron with .60 per cent C steel. The gray iron has approximately the same thermal conductivity and heat constants as the steel but somewhat greater freezing range and a considerably lower solidification temperature; as the result of these differences it requires twice as long as the steel to complete solidification.

It is recognized that the simple method of chill application used in these studies is quite different from usual foundry application. The choice of simple methods for this investigation was dictated by the necessity of understanding the basic principles of the solidification process. The more complex conditions developed by conventional use of chills does not alter in any way the basic effects which have been outlined; the differences are one of degree rather than kind. The question of variations of degree of chill effects in foundry applications is recognized to be of great practical

importance and continuing research is being directed toward this phase of the problem.

A report on this subject is to be presented at the 1952 AFS annual meeting as part of the Steel Division program.

References

1. H. F. Bishop and W. S. Pellini, "Contribution of Riser and Chill-Edge Effects to the Soundness of Cast Steel Plates", *Transactions*, AFS, Vol. 58, pp. 185-197 (1950).

2. H. F. Bishop, F. A. Brandt and W. S. Pellini, "Solidification of Steel from Sand and Chill Walls", *Transactions*, AFS, preprint 51-21 (1951).

3. R. P. Dunphy and W. S. Pellini, "Solidification of Gray Iron in Sand Molds", *Transactions*, AFS, preprint 51-22 (1951).

4. H. F. Bishop, E. T. Myskowski, and W. S. Pellini, "The Contribution of Riser and End Effects to the Soundness of Cast Steel Bars", *Transactions*, AFS, Vol. 59, (1951).

5. R. W. Ruddle and A. L. Mincher, "The Influence of Alloy Constitution on the Mode of Solidification of Sand Castings", *Journal*, Institute of Metals, Vol. 78, pp. 229-248.

6. R. W. Ruddle, "The Solidification of Castings, A Review of the Literature", Institute of Metals (British) Monograph and Report Series No. 7.

How To Select Flasks

(*Continued from page* 97)

another set for a different pattern. Too many bars increase shakeout time. If possible, try to keep all bars at right angles because sharp angles may require tucking or additional ramming to avoid soft pockets. Bars in the drag fall into the same category. The drag cannot be stripped from the casting. The casting must be lifted out, or the drag must be turned over.

Bar thickness depends on size of flask and on molding methods. When sandslinger is used, bars should have sufficient clearance over the pattern for sand to pack properly. If sand is not packed to sufficient density under the bars the molten metal will press into the soft spots and appear later as lumps on the casting face. Bars over ¼-in. thick should be chamfered on the lower edge. Bar clearance on flasks used on squeezer machine may vary from ⅜ to ½ in., depending on contour of pattern. On jolt machines the flask bar clearance usually is from ½ to ⅝ in. At least ¾-in. clearance should be allowed on flask bars under a sand slinger. If grids are used on drags instead of bottom boards or bottom plates, the bars should be at least 2½ in. deep and chamfered on the inside edge. Space between bars may vary to some extent, but 4 x 5 in. is a fair average.

Correct flask specifications are highly essential when ordering flasks from the manufacturer to avoid delay and misunderstanding. The manufacturer possibly might guess your requirements correctly, but there always is the possibility of error in any guessing game.

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For More Details on these Items Use Reply Card—Page 225

MODERN METALLURGY: Hunt-Spiller Mfg Corp., 383 Dorchester Ave., South Boston, Mass.—Bulletin on modern metallurgy for industrial users of ferrous castings describes advantages and disadvantages of a number of new metals and alloys, including air furnace gun iron, high test iron, "BX" iron, "L.C." iron, Ni-resist, Ni-hard, Minovar, Di-iron, carbon steels, carbon moly steel and alloy steel. Tables of compositions, properties and ASTM specifications are included.

For More Details Circle No. 90—Page 225

DUST COLLECTORS: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind.—Catalog 72-B describes cloth tube dust collectors with air flow capacities upward from 252 cfm. Air is filtered through various kinds of cloth—cotton, wool, and synthetics—depending upon the application. Specifications, construction drawings, cut-away views, and illustrations of typical installations are given for each type collector.

For More Details Circle No. 91—Page 225

BELT IDLERS: Chain Belt Co., Dept. PR, 1600 West Bruce St., Milwaukee 4—Bulletin 51-81 on belt conveyor idlers and machinery contains information on the latest designs and developments of this equipment. General engineering information to help in designing and specifying belt idler equipment, and the latest data on lubrication material and techniques are included.

For More Details Circle No. 92—Page 225

SHELL MOLDING: Bakelite Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Booklet on phenolic resins for foundry molds and cores pictures step-by-step procedures in the production of castings from shell molds and discusses fundamentals of each step, including sand mix formulas. Data sheets on various phenolic resins also are offered.

For More Details Circle No. 93—Page 225

MATERIALS HANDLING: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle Creek, Mich.—"Basic Facts About Materials Handling" discusses proper materials storage, latest handling equipment, and how to figure costs of its use. Making the best use of existing machines through utilization of attachments, and multiple usage also is covered.

For More Details Circle No. 94—Page 225

MANGANESE BRONZE: R. Lavin & Sons Inc., 3426 South Kedzie Ave., Chicago 23—A paper dealing with manganese bronze is published in the *Lavingot*, Vol. 7, No. 2 (July, 1951). Paper includes table giving chemical composition and physical properties of popular manganese bronze alloys. Sketches show gating and risering techniques as well as melting, pouring, sand and molding practices. Discussion showing proper test bar designs for manganese bronze, aluminum bronze and red brass alloys, is included.

For More Details Circle No. 95—Page 225

HEAT TREATING: E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33—Technical bulletin, "Heat Treatment of Aircraft Steel," to meet U. S. Government Specification MIL-H-6875, explains how maximum hardness and strength of aircraft and other steels can be developed to meet this specification through use of high-speed quenching oils.

For More Details Circle No. 96—Page 225

MAGNETIC SEPARATORS: Dings Magnetic Separator Co., 4708 West Electric Ave., Milwaukee 46—Catalog C-5000-B describes company's line of magnetic separators and lifting magnets. Removal of iron from wet or dry materials, magnetic concentration and purification, heavy media recovery, and materials handling are discussed.

For More Details Circle No. 97—Page 225

SAND MULLERS: National Engineering Co., 608 Machinery Hall Bldg., Chicago 6—Bulletin 511 covers two new sand mix-mullers, having capacities of 30 and 60 tons per hour. Bulletin 507 describes a complete sand preparing unit designed for small foundries.

For More Details Circle No. 98—Page 225

CASTING INSPECTION: Magnaflux Corp., 5900 Northwest Highway, Chicago 31—Form 146 describes wet-type magnetic particle inspection units for nondestructive testing. Form 140-1 covers portable testing units using powder as the inspection medium.

For More Details Circle No. 99—Page 225

HEATERS: Airtherm Mfg. Co., 758 South Spring Ave., St. Louis—Catalog 802A deals with gas or oil, direct-fired heaters. Typical installation examples, dimensions of various models, and capacity tables are included.

For More Details Circle No. 100—Page 225

VENTILATORS: Iron Lung Ventilator Co., 4014 Prospect Ave., Cleveland 3—Form 40, dealing with power roof ventilators, contains tables giving dimension and ratings of the various sizes.

For More Details Circle No. 101—Page 225

COMPRESSORS: Fuller Co., Catasauqua, Pa.—Bulletin C-6 describes rotary air compressors and vacuum pumps and includes illustrations of typical installations.

For More Details Circle No. 102—Page 225

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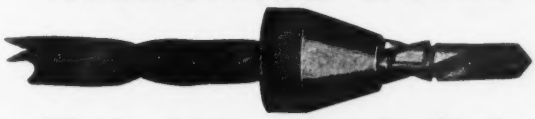

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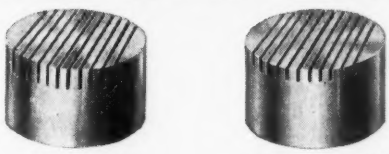

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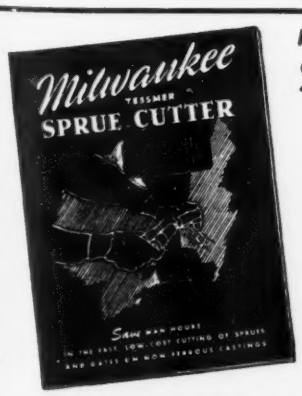

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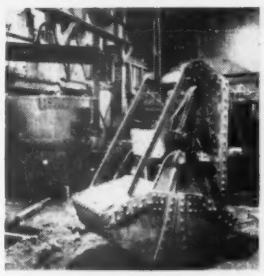

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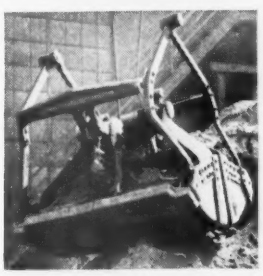

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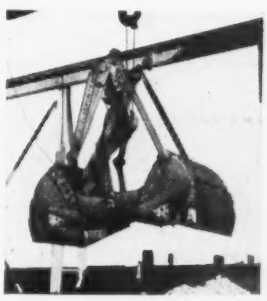

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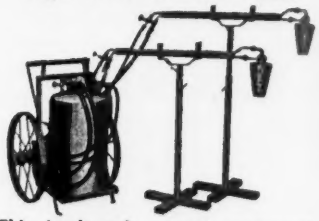

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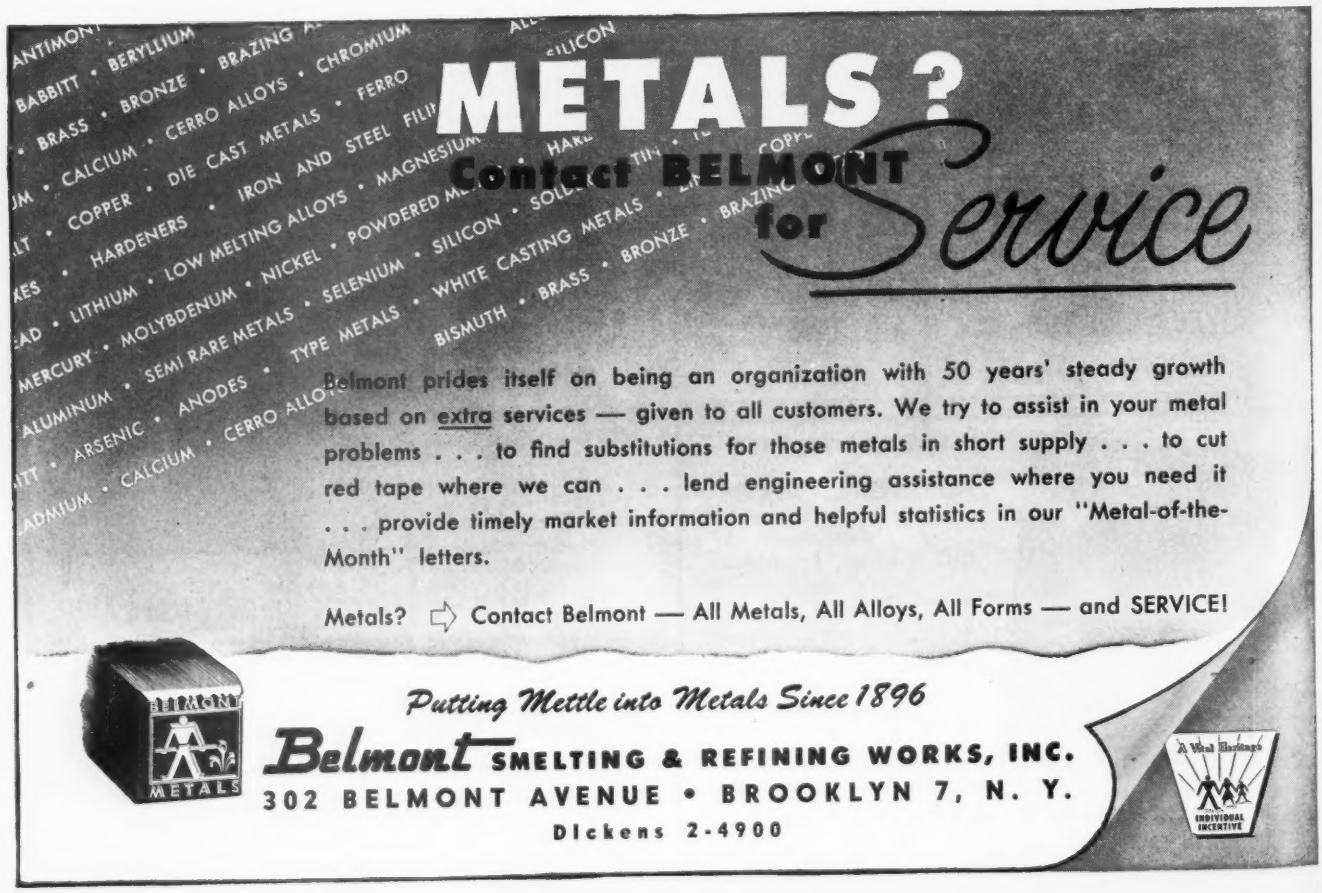
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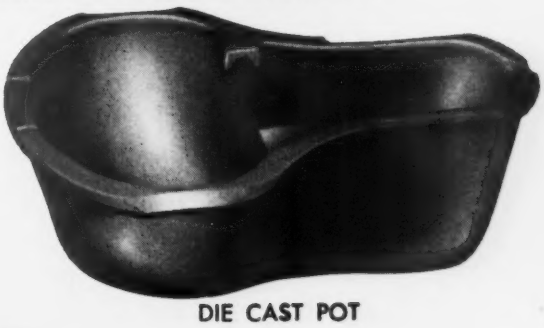

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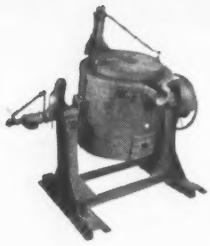

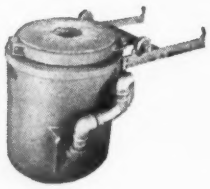

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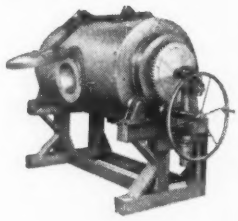

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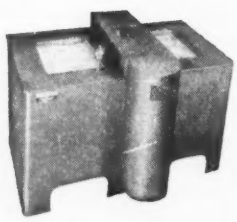

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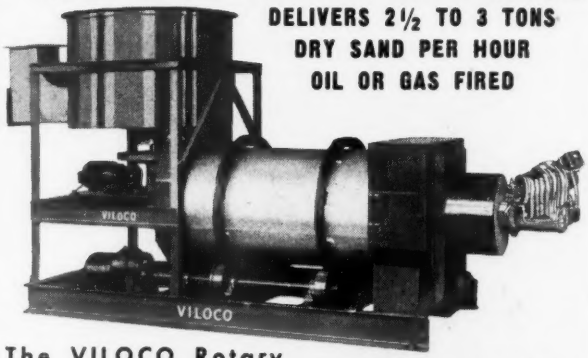

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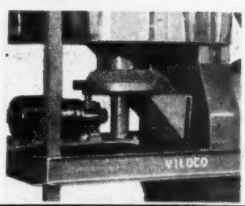

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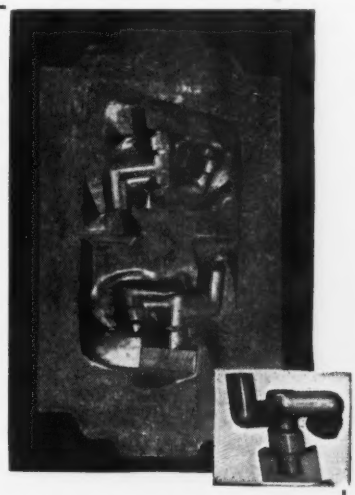

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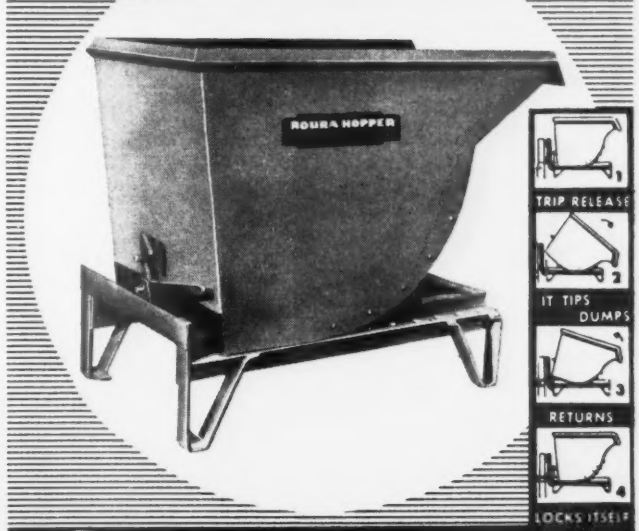

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Produce Round, Square, Rectangular, Triangular, Oval, Hexagon, and Irregular Shaped Extruded Cores Faster and More Economically

In Sizes Ranging From 3/8" to 7"

Manufactured By:

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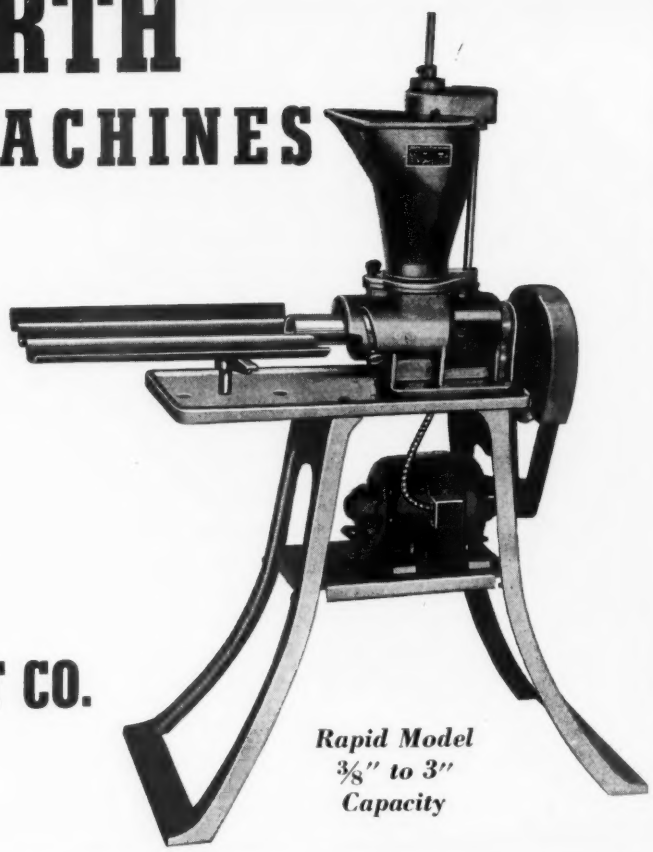

Rapid Model 3/8" to 3" Capacity

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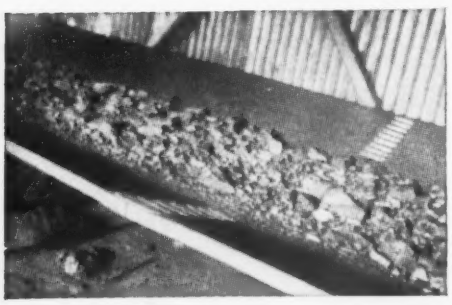
BELT FASTENERS and RIP PLATES



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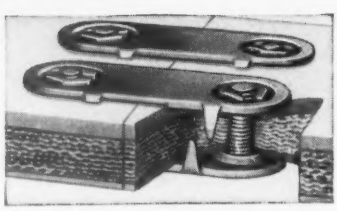

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from the sand when they are coated with hard, heat-and-abrasion resistant CO-LOIDAL-AC Lacquer. You will like the improved mold quality obtained and the extra long life of this superior finish.

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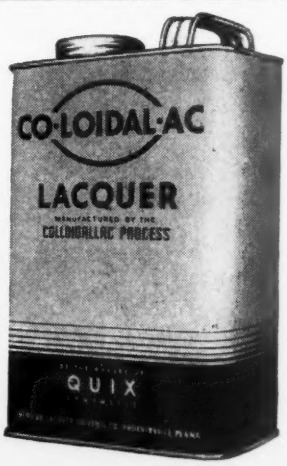

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The MURPHY PISTOL SPRAYER shoots blackening into hidden pockets beyond the reach of swabs. Jobs are completed faster and castings peel better and come cleaner. It is of great value in cleaning permanent molds, for aluminum and other metals as well as for sand blasting. For silica wash, oil, water or any liquid material and as a blow gun for cleaning parts and machinery. We guarantee this sprayer, designed by a practical foundryman . . . Write today!

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PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

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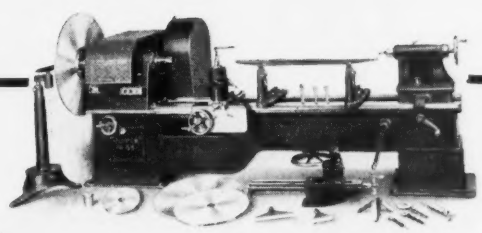
Moisture Elimination Up To 3000 Pounds Per Square Inch

"OLIVER" No. 66 GAP LATHE



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This "Oliver" Lathe for pattern shops has many features for turning large patterns quickly. Stock can be turned 6'6" between centers with gap closed, or 8'6" with gap open. Swings 30" over ways, 26" over carriage, and 24" long with 48" diameter in gap. Spindle rotates 86 to 1820 rpm. with two-speed motor. Write for Bulletin 66.

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. . . a shade to match every iron or steel casting

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FREE Samples and Handbook

Try Smooth-On No. 4 at our expense. Write for free sample in the shade you'd like to try. We'll send also the 40-page Smooth-On Handbook describing other Smooth-On Cements and their time-and-money-saving uses. Write TODAY.

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Hook the yoke over the crane hook and the bucket is ready for work. When the job is finished, take the yoke off the hook and the crane is free for other duties.

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Foundrymen using these stars say they outlast all other stars they have previously used.

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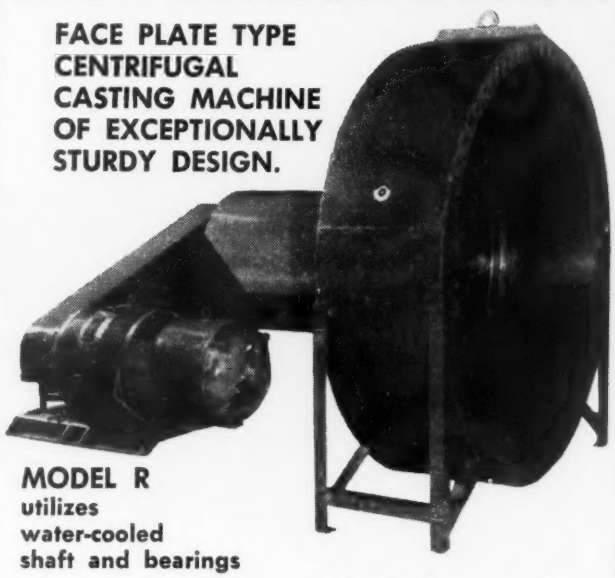
FACE PLATE TYPE CENTRIFUGAL CASTING MACHINE OF EXCEPTIONALLY STURDY DESIGN.



MODEL R utilizes water-cooled shaft and bearings

Castings can be made up to 6 feet in diameter and up to 30 inches in length. It will accommodate mold and casting loads up to 25,000 pounds with absolutely no vibration.

We design and build centrifugal casting machines for high production, utilizing automatic features, as well as special machines as required.

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STAINLESS STEEL SCREEN VENTS
Mesh: #30, #40, #50
Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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A "blend" with JISCO is sound metallurgy.

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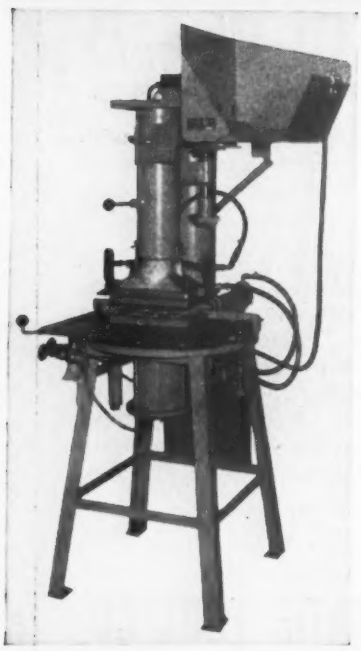

HIGH DRAW MODEL "C-H-E"

Cores up to 15 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

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Let us figure on your requirements.

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- **PLIABLE** Easy to work with.
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STURDY, RIGID CONSTRUCTION ASSURES TOP EFFICIENCY, LOWER OPERATING COST!

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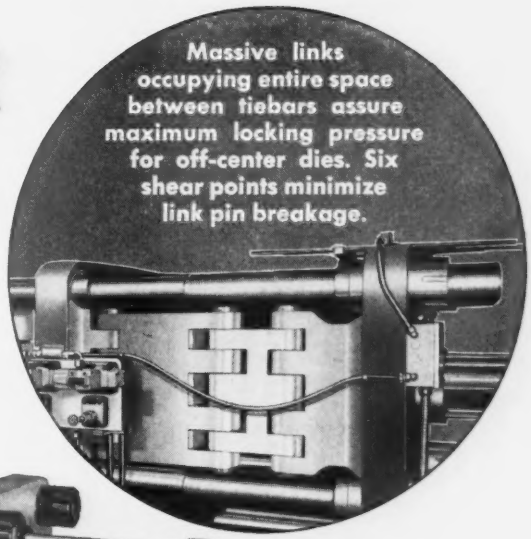
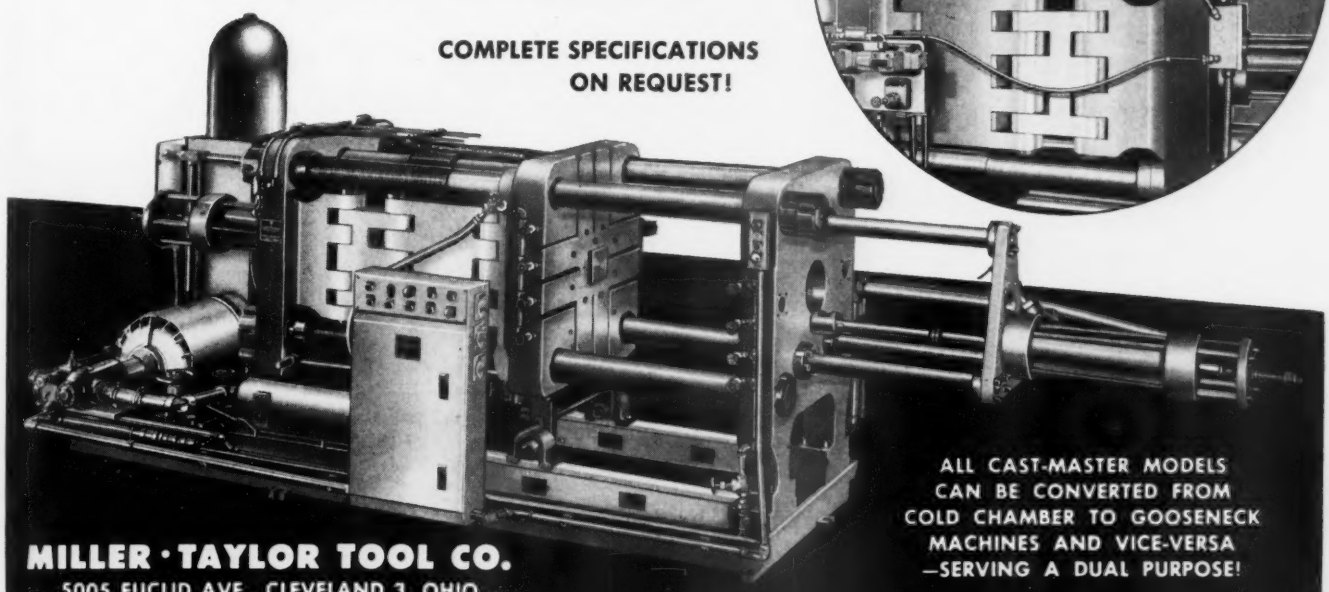


Massive links occupying entire space between tiebars assure maximum locking pressure for off-center dies. Six shear points minimize link pin breakage.



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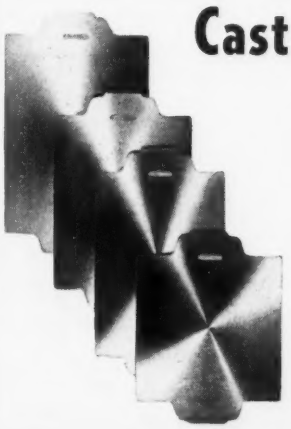

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POWDERED GLASS

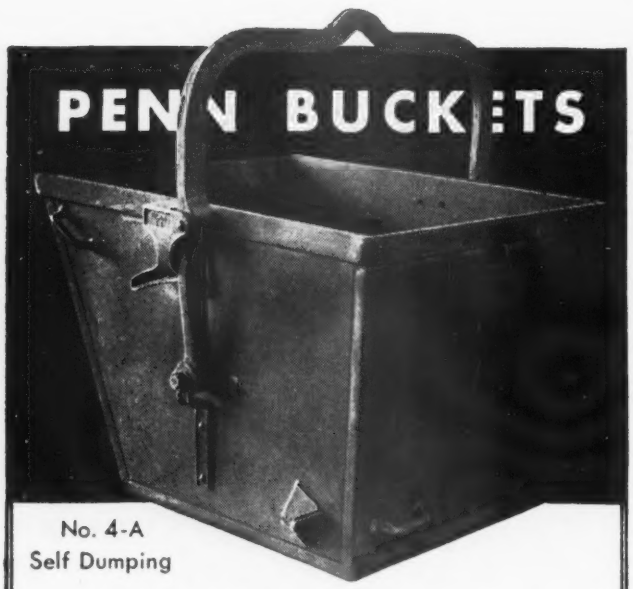
AN EXCELLENT BRASS FLUX

—Economical—

THE BASSICHIS COMPANY

CLEVELAND 13, OHIO

PENN BUCKETS



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Self Dumping

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DOUBLES YOUR CAPACITY FOR SNAGGING AND CLEANING

- *FASTER*
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WITH

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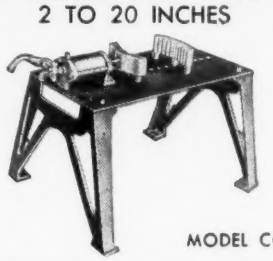
GRIPS FIRMLY ANY SHAPE OF MEDIUM SIZE CASTING 2 TO 20 INCHES



MODEL CG-2

Now . . . the operator can clean and snag twice as many castings because no time is lost trying to get a firm hold on the casting. He can bear down with the grinding wheel because the casting can't fly loose, and he won't lose time if the casting gets hot. Castings are gripped slowly and deliberately, but released instantly by the control of one, easy-to-operate, pneumatic valve. ● Investigate JOY Casting Grips—*you can cut costs with them!*

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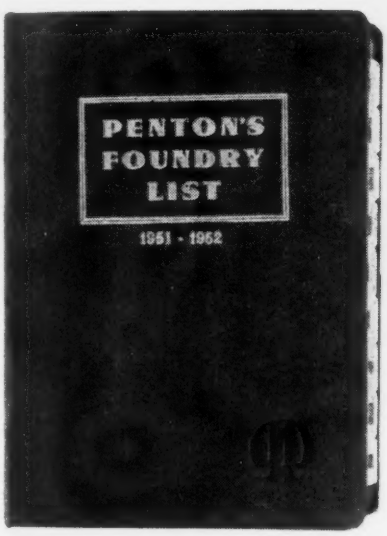
JOY MANUFACTURING COMPANY

OLIVER BUILDING • PITTSBURGH 22, PA.

LIST

of today's Foundry Market



This volume helps you to know the foundry market thoroughly. The new 1951-52 Penton's foundry list provides you with the most complete information available anywhere on the 5,867 foundries in the U.S. and Canada. It tells *who* they *are*, *where* they are located, *what* they melt, how *big* they are and what departments they operate.

Many sales managers and buyers of castings say they could not get along without it. The price is reasonable. For descriptive literature, write to—

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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS

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IF YOUR PROBLEM INCLUDES

chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

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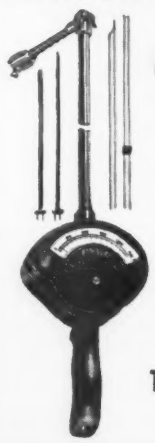
Use the Simplified PYRO Optical Pyrometer

Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*



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Helps insure low-cost production of SOUND, UNIFORM Castings. Has shielded steel housing which is shock-proof, dust-proof and moisture-proof—withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples are instantly interchangeable, without adjustment or recalibration. Large 4-inch easy-reading dial. Equipped with exclusive LOCK SWIVEL. Available in 6 ranges (1000°F to 2500°F). *Write for FREE Catalog #150*

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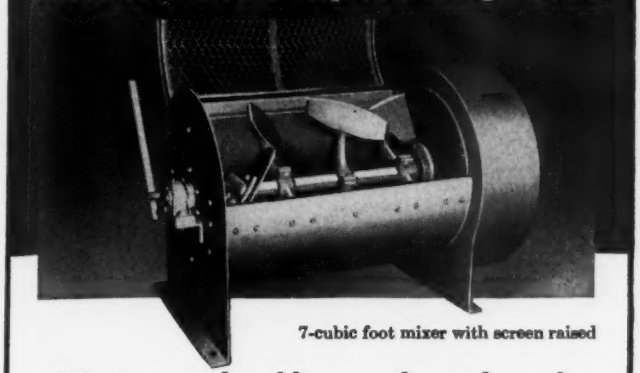
FASTER, BETTER MIXING Lowers Your Operating Cost



7-cubic foot mixer with screen raised

Mix core and molding sands, and cupola patch mixes with MULTI-BLADE MIXERS

- THEY'RE FAST . . . mix and discharge a load in four and a half minutes.
- THEY MIX BETTER . . . the best blade arrangement in any mixer . . . cuts, turns and kneads the mix ten times with every shaft revolution.
- THEY'RE QUALITY BUILT . . . trouble free, self-contained, have anti-friction bearings, direct drive (no clutch or belts), and come in sizes from 3 to 60 cu. ft. capacities. Special and larger mixers also available.

Get these advantages and resultant savings. See your foundry equipment dealer or write direct to

MULTIPLEX MACHINERY CORP. ELMORE OHIO

381 tons coal in reserve

A Michigan manufacturer had been caught short of coal only too often. To avoid that situation in the future, the management had us erect two 18 x 60 ft. silos; one of them to feed the stokers, the other to keep a reserve supply of coal. When full, both silos hold approximately 700 tons—and that's enough to outlast a serious delivery failure.

There's an idea here for users of all kinds of flowable bulk materials: *1st.* Plenty of storage capacity to avert shutdowns; *2nd.* Neff & Fry Storage Bins, the silos which stand from generation to generation without rusting, rotting, spalling—without the need for painting and face-lifting.

If you're immediately or remotely interested in silo-type storage, ask for our folder, *"Bins With the Strength of Pillars."*

THE NEFF & FRY CO. • 214 Elm St., Camden, Ohio

SUPER-CONCRETE STAVE STORAGE BINS — NEFF & FRY

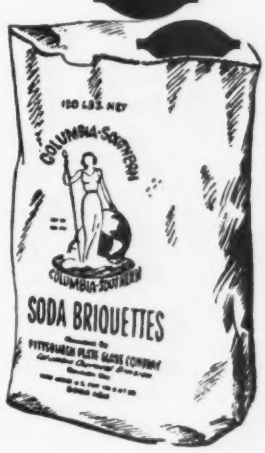
COLUMBIA-SOUTHERN SODA BRIQUETTES FOR REDUCTION OF SULPHUR AND PHYSICAL CLEANSING OF IRON

You will find Columbia-Southern Soda Briquettes efficient and inexpensive to use in your blast furnace or foundry operations.

Columbia-Southern Soda Briquettes are designed specifically for iron desulphurizing and physical cleansing of iron. That is why they work so fast and effectively.

Walnut in shape and size, they expose maximum surface area for quick, dependable performance. There is no dust, no waste, to Columbia-Southern Soda Briquettes.

They are packed in handy 100 lb. paper bags for ease in moving and storage. Order your supply now and see if you don't agree that they do the job faster, better and more efficiently.



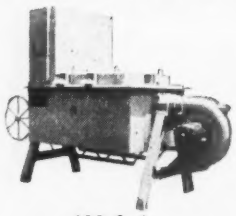
COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

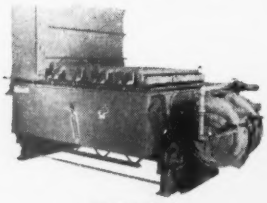
FIFTH AT BELLEFIELD, PITTSBURGH 13, PA.

DISTRICT OFFICES: BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • HOUSTON • MINNEAPOLIS • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS

SUPERIOR PERFORMANCE



400 Series



1000 Series

Reda Stack-Loading melting furnaces for ferrous and non-ferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive, types; that is why, with Reda furnaces there is less down time for maintenance, longer, uninterrupted melting runs, and lower melting costs.

Another feature is the Reda Burner arrangement which can operate from oil and gas simultaneously or be switched from one fuel to the other instantly.

Write or phone for complete details.

	CHARGE		MELT CAP./HR.	
SERIES	IRON	BRONZE	IRON	BRONZE
400	400#	450#	800#	1350#
550	550#	625#	1100#	1875#
1000	1000#	1125#	2000#	3375#

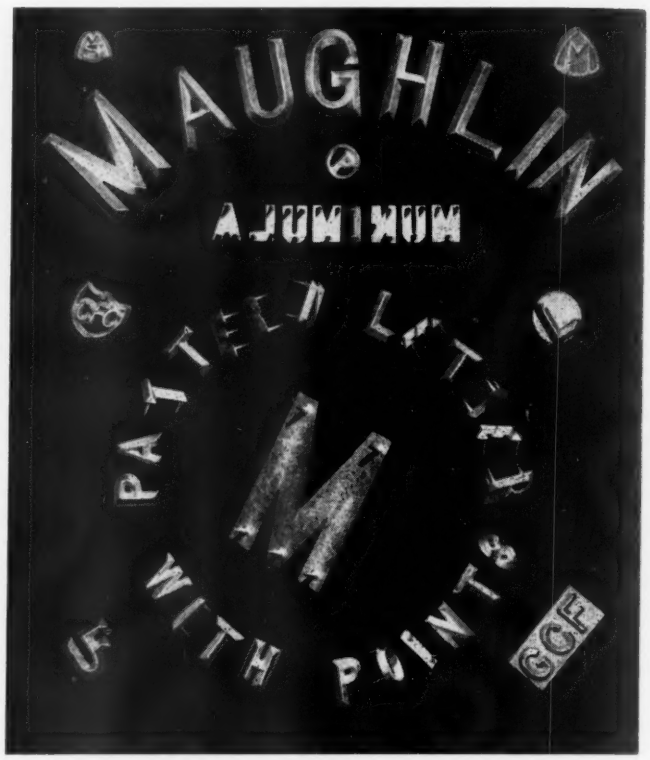
LARGER MODELS ON REQUEST

STACK LOADING
DIRECT FIRED—REFLECTING TYPE

REDA FURNACE

REDA PUMP CO. Bartlesville, Okla.

A Hammer Blow Secures Letters To Pattern

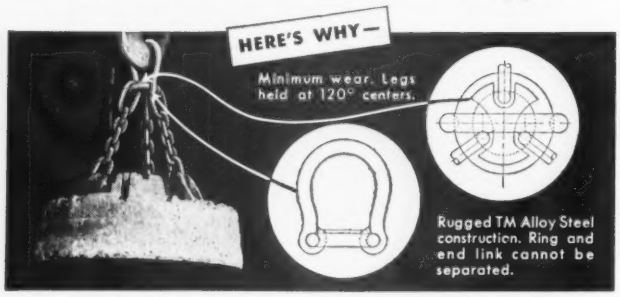


THE H. P. MAUGHLIN CO.
953 Ingleside Ave., Columbus, Ohio
Manufacturers of letters and numbers exclusively for over 30 years

TM *Alloy Steel Downtown*

Frictionless
MAGNET CHAINS

DO MORE WORK, LAST LONGER, COST LESS than conventional types!


HERE'S WHY—
Minimum wear. Legs held at 120° centers.
Rugged TM Alloy Steel construction. Ring and end link cannot be separated.

On-the-job tests prove TM Alloy Steel Downtown Magnet Chains superior to any other three-leg assemblies on the market. Patented design of end link and horizontal ring with special locating plate keep chain legs at 120° centers. This prevents ganging-up, excessive friction and twisting . . . assures level lifts. Long life, safety and economy is assured by TM Alloy Steel Construction. Great strength, high resistance to abrasion, grain growth and shock at sub-zero temperatures are only a few of the TM Alloy Steel qualities. Send coupon!

S. G. TAYLOR CHAIN COMPANY, Hammond, Indiana

S. G. TAYLOR CHAIN COMPANY
Dept. 18 Hammond, Indiana
Rush literature and prices on TM Alloy Steel Downtown Magnet Chains.
Name_____
Address_____

TAYLOR MADE
A GREAT NAME IN *Chain* SINCE 1873

ANALYSIS OF CASTING DEFECTS

133 pages, illustrated
Price $4.25 Postpaid

To help foundrymen minimize and eliminate defective castings. Thirty-one basic casting defects are listed and described. Defects are defined simply and completely, illustrated by 101 figures collected from foundries of the United States and Canada.

THE PENTON PUBLISHING COMPANY
Book Department
1213 W. 3rd St., Cleveland 13, Ohio

Cut Cleaning Costs with AMERICAN SHOT AND GRIT

Tough American Shot and Grit is designed to be used over and over. American's own manufacturing process assures uniform hardness and size. All sizes graded to SAE specifications. Packed in 100-pound bags.

THE AMERICAN STEEL ABRASIVES CO.,
GALION, OHIO
MEMBER FEMA

CLASSIFIED ADVERTISING RATES

POSITION WANTED — Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 15.00	$ 13.75	$ 12.50	$ 11.25
2 inches	27.00	25.00	23.00	21.00
3 inches	40.00	36.50	33.50	30.00
4 inches	50.00	46.00	41.50	37.50
5 inches	60.00	55.00	50.00	45.00
6 inches	73.50	66.50	60.00	53.50
7 inches	82.50	75.00	67.50	60.00
8 inches	91.50	83.50	75.00	66.50
1 column	110.00	100.00	90.00	80.00
Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

Penton Building, Cleveland 13, Ohio

CLASSIFIED ADVERTISING

Help Wanted

CAPABLE FOUNDRY SUPPLY SALES-SERVICE MAN

We are looking for a young man, age 28 to 40. A nationally known and soundly financed company, with an established sales volume, requires sales and service representation in the Northern half of Ohio. Man preferably should live in the North Central portion of the state. We want an ambitious, hard-driving man, who can work without close supervision and who is seeking to provide his own security in the field of sales work. Good salary, plus bonus, with car and expenses furnished. We want a man who can meet the following specifications:

1. Education—college training preferred. Evidence of considerable self-education and improvement will be acceptable.
2. Must have had foundry experience. A sound background of foundry sand use and control will be very helpful in doing a good job on both service and sales development.
3. Should be preferably married and a home-owner, a Christian of moderate habits. "Good-time Charlies" and "Chasers" need not apply, as they can't work hard enough or long enough to please us or our customers.
4. Should have had some sales experience or else display considerable aptitude for sales work.
5. Must have an understanding of, and an interest in, foundry equipment, processes, and the production of better castings.
6. Must be willing to give good references, both as to character and credit relations, and take job aptitude test. We pay all expense for interviews and tests.

Give all details and enclose picture or snapshot with letter of application. All replies will be held and treated in strict confidence.

BOX 709

FOUNDRY **CLEVELAND 13, OHIO**

STEEL FOUNDRY MEN

Opportunities for the following men in a large steel foundry:

Experienced Unit Foremen for
- Melted Metals Dept
- Foundry
- Core Room
- C.F.&A.
- Inspection
- Pattern

Also openings for engineers and draftsmen. Government owned defense plant in Chicago area to be operated on armor steel castings. Company operating set-up sufficiently large and aggressive to afford permanent opportunity to men whose performance proves to be outstanding.

BOX 742

FOUNDRY **CLEVELAND 13, OHIO**

CASTING SALESMEN

Experienced salesmen for brass, bronze and aluminum production castings needed in the St. Louis, Chicago and Kansas City areas. This company is at present expanding its production facilities for rollover type production work. Give detailed information as to background and sales experience. Commission basis. Reply confidential.

BOX 752

FOUNDRY **CLEVELAND 13, OHIO**

NONFERROUS FOUNDRY SUPERINTENDENT MANAGER

To set up and operate foundry including obtaining orders and direct operations for newly established nonferrous mechanized plant in New York City area. Must be thoroughly experienced. Kindly state age, experience in detail, including previous employers and length of service and also salary desired. Address: Box 711, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

For one of New York's leading aluminum foundries. Must know chlorinizing gas process of aluminum, the making of aviation and Navy specifications, alloy castings. Full and complete charge of 12 molder jobbing foundry. Give experience and starting salary. Address: Box 747, FOUNDRY, Cleveland 13, Ohio.

FOREMAN—NONFERROUS

Good opportunity for progressive thinking man who can rig jobs and handle men for maximum production of quality castings. Must be experienced in all phases of operations. New York City area. Address: BOX 769, FOUNDRY, 60 EAST 42nd ST., NEW YORK 17, N. Y.

METALLURGIST

With steel foundry background preferably with experience in foundry control work. Write stating experience, education and starting salary requirements. Address: Box 762, FOUNDRY, Cleveland 13, Ohio.

MECHANIZED FOUNDRY SUPERVISOR

Experienced on conveyor operation of squeezer, stripper and rollover machines for completely mechanized iron foundry, located in the east. Must be a leader capable of controlling men and increasing output. Excellent opportunity with old established company. Address: Box 718, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Excellent opening for metallurgical engineer with interest and knowledge of modern research methods in foundry field. Practical foundry background preferred. Excellent opportunity for personal and professional advancement in expanding organization.

METALS DEPARTMENT
ARMOUR RESEARCH FOUNDATION
CHICAGO 16, ILLINOIS

JUNIOR DRAFTSMAN

Old established New England firm. Opportunity for advancement. Will aid in obtaining or completing college education. Write stating experience, education and starting salary requirements. Address: Box 763, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST OR ENGINEER

Young metallurgist or engineer preferably with foundry experience for sales position with large chemical company. Sales and development work on the use of synthetic resins in the foundry will be prime responsibilities. Previous sales experience to the foundry industry desirable. Send compelte resume to: Box 748, FOUNDRY, Cleveland 13, Ohio.

GOOD OPPORTUNITY

FOR POTENTIAL PLANT SUPERINTENDENT
Aggressive man between 35 and 45 years of age needed in well established company. Needs pattern background and extensive experience in planning and process control in steel foundry industry with emphases on light and medium castings up to 5 tons in weight.

BOX 727

FOUNDRY **CLEVELAND 13, OHIO**

DIE CAST DIE DESIGNER OR PERMANENT MOLD DESIGNER

Light metals experience required. This is a permanent job with unlimited future for qualified man. Position is in modern midwest foundry facility now undergoing expansion. Salary commensurate with ability. Bonus plan. Send complete resume. Address: Box 499, FOUNDRY, Cleveland 13, Ohio.

CHIEF METALLURGIST

To supervise the metallurgical department of a production gray iron foundry, pouring over 150 tons of castings daily. Plant is located in Wisconsin. An excellent opportunity for a young man who is interested in advancing to positions of even more responsibility. Provide previous work history, references and salary desired in first letter.

BOX 746

FOUNDRY **CLEVELAND 13, OHIO**

FOUNDRY SUPERINTENDENT

For shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability, and good practical and technical background. Excellent opportunity with long established company of best reputation.

Reply in confidence giving full information as to age, background and experience as well as salary requirements. Address: Box 470, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERVISOR

Experience in steel and high alloy jobbing work essential. Must be capable of accurately following core making schedules, supervise diligently the making and proper drying of all types of cores in light to medium size. Maintenance of discipline among the workers and highest quality of cores a prime requisite. Must be a superior type supervisor. Salary commensurate with ability, plus bonus. Address: Box 767, FOUNDRY, Cleveland 13, Ohio.

CORE ROOM FOREMAN

Modern gray iron foundry located in northwest suburb of Chicago needs experienced man capable of supervising core room operations involving small to medium sized cores—blowers and bench. Exceptional opportunity with progressive organization. Write giving past experience, qualifications and references. Address: Box 749, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

For magnesium sand foundry. Must have thorough knowledge of all phases of foundry operation. Castings must stand rigid inspection, Air Force and X-ray specifications. Excellent opportunity and rapid advancement for right man. Please indicate past foundry experience, age and salary expected. Address: Box 751, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Large aluminum foundry in Michigan has an opening for a General Foundry Foreman. The applicant must be experienced in all phases of aluminum sand foundry work, including the gating of patterns. Address: Box 764, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

For modern production brass foundry. Good opportunity for a hustler. Give complete information about yourself and reference in first letter. Address: Box 714, FOUNDRY, Cleveland 13, Ohio.

WOOD PATTERN MAKER

With foundry experience for working foreman of pattern and flask shop of grey iron jobbing foundry with 50 ton daily capacity making light, medium and heavy castings. Prefer man 40 to 50 years old. Located in Central New York. Address: Box 743, FOUNDRY, Cleveland 13, Ohio.

WANTED

Steel castings salesman for steel foundry in California making castings from 1—3000 pounds. State experience in full. Address: Box 759, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Experienced in production and jobbing work in aluminum and brass foundry. Wanted for Northern Ohio. State full details in first letter. Address: Box 708, FOUNDRY, Cleveland 13, Ohio.

Employment Service

EMPLOYMENT COUNSEL, INC.

"All The Name Implies"

JOHN COPE, Manager Foundry Dept.

Recruiting men for employers in the foundry industry throughout the nation. Openings in Steel, Malleable, Gray Iron and Non-Ferrous—Jobbing and Production. Salaries to $20,000.

PLANT MANAGERS
GENERAL FOREMEN
CORE FOREMEN
CLEANING FOREMEN
PATTERN FOREMEN
INDUSTRIAL ENGRS.
SUPERINTENDENTS
MOLD FOREMEN
MELTING FOREMEN
MAINTENANCE FOREMEN
METALLURGISTS
TIME STUDY ENGRS.

And all other Administrative and Sales Positions.

WRITE or CALL for registration.

Completely Confidential

SUITE 500
CHICAGO 2, ILLINOIS

7 WEST MADISON ST.,
FINANCIAL 6-2100

Employment Service

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.

Representative Wanted

REPRESENTATION WANTED

Well established manufacturer of leather work gloves designed for foundry and other industrial work wants Chicago and Detroit representation on line. Good opportunity for men with established contacts. In reply, advise territory covered and lines handled. Address: Box 756, FOUNDRY, Cleveland 13, Ohio.

METALS, MINERALS & CHEMICALS

Salesman for exclusive territory on high commission basis. Write full and complete personal and sales data in confidence. Include small photo, map, etc. Address: BRAM CHEMICAL CO., 820—65th AVE., PHILADELPHIA 26, PA.

FOUNDRY REPRESENTATIVE

Prominent Eastern Aluminum and Bronze foundry, producing high quality castings of sand and permanent mold is in a position to accept additional work from only well-rated firms. Address: Box 691, FOUNDRY, Cleveland 13, Ohio.

WANTED

Representatives for line of turbo blowers especially designed for foundries. Address: Box 750, FOUNDRY, Cleveland 13, Ohio.

Accounts Wanted

ACCOUNTS WANTED

Well established with large following wishes to hear from manufacturers of equipment, supplies or products for representation in New England. Twenty years of experience in sales, engineering and consulting. Address: Box 722, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT

Practical grey iron foundryman. Light to heavy jobbing and light production. Twelve years as executive. Good trouble shooter, cost and scrap minded. Address: Box 766, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

PRACTICAL-TECHNICAL

Modern grey iron foundryman, age 49. Molder by trade, graduate metallurgist. Outstanding background of experience and ability in highly mechanized high production foundry, using most modern methods and equipment. Machine tool, high pressure castings, diesels, automotive. Sound in sand control, molding, cores, cleaning, working from blueprints and minimum costs. Wants to connect with sound reliable firm needing services of a high type foundryman to get results. Address: Box 544, FOUNDRY, Cleveland 13, Ohio.

CORE MAKER

Honest, dependable and thoroughly experienced core maker desires to make a permanent connection with a progressive foundry in Southern or Central Michigan or Chicago area. Best references. Available after Feb. 15, 1951. Address: Box 758, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER
STANDARDS & METHODS

Several years' experience in methods, time study, production and cost control. Let me reduce your cost and increase production. Well qualified as assistant to management. Address: Box 744, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Modern high production gray iron foundryman, practical, technically trained in the most modern mechanized foundry equipment. Well versed in all phases. Production, quality, slingers, jolts, coreblowers, hot blast cupolas, modern cleaning equipment, high tonnage, etc. Seeking new connection with large firm. Background of experience and ability is outstanding in foundry world. Only firm needing services of such a foundryman please answer. State all facts in first letter. Salary requirements high. Address: Box 547, FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 603, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

A top notch foundryman with twenty-one years' experience in all phases of foundry work. Desires position as manager or superintendent in medium to large company, jobbing or production, alloy, semi-steel and gray iron. Now employed, available on short notice. Address: Box 726, FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

Wood and metal work—also plastic. Experience about 40 years. Capable of running shop or working foreman or bench. First class mechanic. Match plate work and precision castings. Can run shop or set up new pressure cast shop for pattern work and precision castings. Address: Box 770, FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

Desires position as molding foreman only. 30 years' experience in all types of metals and all sizes castings including marine, diesel, automotive and agriculture. Very well qualified on production line. Address: Box 755, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

FOUNDRY MANAGER

Steel, iron and malleable iron. 25 years' experience, technical education and practical experience in every phase of foundry operations and managerial ability. Address: Box 768, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT
PRACTICAL—TECHNICAL

Progressive modern foundryman with a background of 28 years' experience producing quality castings. General jobbing, production in modern foundries. Well versed in all phases and costs. Making change and would like to contact old sound firm needing outstanding foundryman for results. Foundry employing not over 250 desired. Address: Box 545, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Dependable and experienced metallurgist and electric melter—acid and basic practice, laboratory, melting, heat treat and sand control. Capable of increasing quality control and elimination of trouble causes with use of technical and practical experience and overall foundry knowledge. Looking for responsible position with reliable electric steel foundry. Address: Box 704, FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVE

Selling grey iron and alloy castings. Production and jobbing A-1 accounts. Location—Michigan. For particulars address: Box 719, FOUNDRY, Cleveland 13, Ohio.

MANAGER—ASSISTANT TO PRESIDENT

Steel, iron, brass. Thoroughly experienced in every shop operation, metallurgy, engineering, accounting and management. Excellent ability to develop a superior organization by leading, teaching and example. Outstanding reputation for keen analysis, sound judgment and a rare combination of practical experience, managerial ability and effective personality. Address: Box 375, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Experienced in gray iron and some nonferrous on both production or jobbing basis. Exceptional background of practical and technical training Cost minded and have the best in references. Eighteen years of executive background. Address: Box 707, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Capable of taking full charge of small or medium foundry—gray iron, nonferrous. Broad experience in producing quality light and medium castings. Well versed in production problems and scrap control. Salary or salary and production bonus. Midwest preferred. Address: Box 738, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Practical gray iron foundryman, molder by trade, technically trained graduate metallurgist. Broad background of experience in general jobbing and high production of quality castings. Well versed in all phases of the foundry. Dry and green sand, pit molding, cores, cupola and metal control. Wants connection with progressive foundry needing real foundryman that can produce required results. Address: Box 546, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT AND MANAGER

Experienced in operations, sales and with proven administrative ability in the light metals field is free to make a change at this time. Interested in setting up a new foundry or rejuvenating an old plant. Experienced in converting red figures on the operating statement to black ones. Acquainted with government and aircraft requirements and the production of quality castings. Interested in a project where hard work and intelligent effort will pay off. Address: Box 771, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

30 years' experience, grey iron foundry. Familiar with metallurgy, cupola operation, molding and all phases of good foundry practice. Can also quote prices from blueprints. Address: Box 760, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

GENERAL FOREMAN OR FOREMAN

Large or small castings in gray iron or nonferrous, green or dry sand. Have been general foreman for 20 years with practical experience in all foundry details. Address: Box 687, FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP SUPERINTENDENT

Qualified to take full charge of pattern engineering and rigging as well as construction of same, for mass production of either grey iron or malleable castings. Age 48. 20 years' experience. Also pattern maintenance. Address: Box 676, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Practical foundryman with 28 years' experience, capable of taking charge of all operations, desires position in production gray iron foundry. Cost minded and producer of sound, quality castings, low scrap guaranteed. Address: Box 754, FOUNDRY, Cleveland 13, Ohio.

Opportunities

OPPORTUNITY

Small, well equipped iron foundry, for sale, lease or operation on share basis to capable foundryman who can make our castings of light and medium floor type and squeezer work. Foundry has jolt squeezer, plain squeezers, rollover machines, mechanical charger, etc. Location North Central Indiana. Address: Box 739, FOUNDRY, Cleveland 13, Ohio.

OPPORTUNITY

The only grey iron foundry in the state now available thru purchase outright or thru part owner operator basis. Owner willing to make reasonable arrangements and he seeks to be removed from responsibilities due to age. Exceptional opportunity for aggressive metallurgist or experienced foundry operator. For more details write: J. G. IHNET, CITY PROMOTIONAL DIRECTOR, WATERTOWN, S. D.

Available Capacity

GRAY IRON FOUNDRY
AVAILABLE CAPACITY

We have open capacity in two foundries enabling us to supply both light and medium heavy gray iron castings of high quality. One is a highly mechanized, high speed production foundry capable of producing large volumes of light and medium castings and the other produces castings up to 1000 pounds. Address: Burnham Corporation, Zanesville, Ohio.

IMMEDIATE CAPACITY AVAILABLE

For semi-steel castings, pressure type as well as usual run of work. Quantity runs of 100-500 lbs. castings. Jobbing lots of castings 500 to 10,000 lbs. Address: DARLING VALVE & MFG. CO., WILLIAMSPORT, PA.

AVAILABLE CAPACITY

Patterns and driers, complete shop service. Located near Detroit. Prompt delivery on first class work. Address: Box 698, FOUNDRY, Cleveland 13, Ohio.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

AVAILABLE CAPACITY

We have available capacity for aluminum sand castings either pressure or nonpressure. Loose or plate patterns.

HOOTMAN ALUMINUM
FOUNDRIES
BRYAN **OHIO**

Wanted-To-Buy

WANTED

BRIDGE CRANES

ARNOLD HUGHES COMPANY
765 PENOBSCOT BLDG. DETROIT 26, MICH.
WOODWARD 1-1894

WANTED TO BUY

Steel Apron Conveyor for hot castings, 18", 20", 24" or 30" wide.
Pottstown Tapping Machines.
2—16" Cyl. Jolt Squeeze Stripper Molding Machines
1—14" Cyl. Rollover Molding Machine
STEEL FLASK EQUIPMENT
18—14 x 16 6" Drag 4" Cope
18—12 x 18 6" Drag 4" Cope
24—12 x 23 6" Drag 4" Cope
18—14 x 20 7" Drag 7" Cope
12—16 x 16 6" Drag 6" Cope
12—18 x 18 6" Drag 9" Cope
24—18 x 18 6" Drag 6" Cope
24—24 x 24 7" Drag 7" Cope
18—16 x 26 6" Drag 6" Cope
NATIONAL FOUNDRY COMPANY OF NEW YORK, INC.
2-56 SANDFORD ST. BROOKLYN 5, NEW YORK

WANTED

SANDSLINGER WANTED—Junior Tractor. Address Box 656 FOUNDRY, Cleveland 13, Ohio

WANTED

1—#2 Simpson muller complete with skip hoist or #60 speedmuller complete. 1—Heavy duty sprue cutter for steel foundry. 1—Simplicity shakeout size 5 x 9 approximately. Address: Box 753, FOUNDRY, Cleveland 13, Ohio.

WANTED

Soil pipe fitting patterns and arbors. Address: CHESANING PIPE CO., CHESANING, MICHIGAN.

WANTED

Fabricated steel flasks—every size from 16 x 16 up. Must be in excellent condition and reasonably priced. ADDRESS: MARCH-BROWNBACK CO., INC., POTTSTOWN, PA.

WANTED

Steady supply of novelty castings and antique reproductions, rough or finished, direct from foundries by a rated company. Send prices, pictures or samples if possible. Address: Box 732, FOUNDRY, Cleveland 13, Ohio.

WANTED

One used screenerator and one mullbarrow, used. Address: GRUBBS FOUNDRY, 4700 ROSA ST., EL PASO, TEXAS.

WANTED

3—Lindberg Fisher hydraulic tilting crucible furnaces, nose pouring, gas fired, capacity 1000 lbs. aluminum.

TRIMEDGE INC.
YOUNGSTOWN, OHIO

PAYLOADER WANTED

Rebuilt HA payloader with hydraulic lift. Write or phone:

MOLINE IRON WORKS
MOLINE, ILLINOIS

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOR SALE

Our business and patterns—excellent opportunity for small foundry needing squeezer work. Address: Box 761, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY—GRAY IRON

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story height 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

COMPLETE MECHANIZED gray iron foundry. Capacity 125 tons in eight hours. Producing light and medium castings. Eastern U. S.

EDWARD H. ZOLL
FOUNDRIES SOLD AND LEASED
790 BROAD ST. **NEWARK 2, N. J.**

FOR SALE

Small New Jersey nonferrous ornamental and pattern foundry, wide variety steel and iron flasks, 2 pit & 1 tilting gas furnaces, Simpson mixer, 2 brick ovens, 3 ton manual traveling crane 19' span 58' runway, steam heat. Retiring. Address: Box 745, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Will receive offers on buildings and equipment known as Kelly Foundry and Machine Co., Goshen, Indiana. Has Big Four R.R. siding, 45,000 sq. ft. 72" cupola. Heirs wish to dispose of property at once. Will be sold at a bargain. Address: ECKSTADT & LEER, 39 SHOOTS BUILDING, GOSHEN, INDIANA.

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOR SALE

Wisconsin nonferrous foundry and manufacturing, 60 miles from Chicago. Have large volume of rated orders. With increase in government expenditures, you should clear this in one year. Price $55,000. Retiring. Address: Box 504, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY

Well established small manufacturer in Mid-West Mfg. city wishes to sell, going jobbing foundry. Modern equipment for squeezer and floor molding. Will sell or lease real estate. Seller will continue to need castings. Good opportunity for the right buyer.

BOX 765

FOUNDRY **CLEVELAND 13, OHIO**

For Sale

FOR SALE

Sand Cutter—American Wheelabrator #79-60" model "M" sand cutter. Slightly used, up-to-date model, good as new. Contact

NEENAH FOUNDRY COMPANY
NEENAH, WISCONSIN

CLASSIFIED ADVERTISING

For Sale

FOR SALE

Removed from large Cincinnati foundry—some new and some less than 2 years old

Herman—6000# series ROLLOVER - PATTERN DRAW MACHINE 50 x 60 table, 15" cylinder, 40 x 60 table independent Jar Machine as complete unit. Late.

Herman—6000# series JOLT-STRIP MACHINE 48 x 54 table, 12" draw. Late.

Pangborn—AIR SHOT BLAST ROOM, complete with 11 ft. dia. turntable, all motors, controls, etc. Ready for operation. Model U.S.1.

Osborn—JOLT ROLL OVER MACHINE, Model 405, 19 x 56.

Osborn—JOLT STRIPPER, Model 405, 21 x 53.

Osborn—JOLT ROLL OVER, Model 406, 36 x 24.

Osborn—JOLT STRIPPER, Model 406, 36 x 52.

Modern Equpt. Co.—CUPOLAS #9 — Whiting #8.

R-C POSITIVE BLOWER 12 x 20, 20 hp.

R-C POSITIVE BLOWER 22 x 66, 75 hp.

MIXING LADLES, 1000# cap. to 4000#.

V.C.G.-3 SUPER GYROSET SHAKE OUT, 6' x 8' deck, complete.

(1) Osborn SQUEEZER MACHINES — regular size. Portable.

(2) #276 J Osborn SQUEEZER MACHINES—large size. Portable.

(3) PKL 14 Int. JOLT SQUEEZE PIN LIFT MACHINES. Portable.

PKL 12 Int. JOLT SQUEEZE PIN LIFT MACHINE. Portable.

Am. SAND CUTTER, Model AA, #111, 7½ hp, 220/440 v.

(2) Webster & Perkins PEDESTAL GRINDERS, 1200 rpm.

Everett STAND PEDESTAL GRINDER.

Gardner GRINDER, 52" horizontal, 20 hp. Practically new.

AIR COMPRESSOR—INGERSOLL-RAND, IMPERIAL TYPE 10—500 CFM, 100 HP, WITH NEW LATE TYPE HEADS AND NEW AFTER COOLER. CAN BE SEEN IN OPERATION. COMPLETE $3500.00 F.O.B.

Beardsley & Piper—SAND SCREENARATOR, Model S, 3/60/220/440 volt, steel wheels, $325.00 f.o.b.

Tabor — PORTABLE SHOCKLESS JARRING ROLL OVER & PATTERN DRAWING MACHINE, 24" x 16", $350.00 f.o.b.

AIR COMPRESSOR, Sullivan 11 x 10, 40 HP, AC motor & starter, $750.00 f.o.b.

MAGNETIC SEPARATOR—Ding's Mfg. 12" x 18", 110 V., S. Ph. motor, 2 hp., ser. R 5771, $600.00 f.o.b.

SAND BLASTING TANK, Pangborn, Model 1AV11, $150.00 f.o.b.

SPHERICAL FURNACES—Romph Mfg., cap. up to 3000#.

DEGREASING UNITS—all sizes.

AIR TOOLS.

FANS & BLOWERS—up to 125,000 cfm.

ELECTRIC FEED RAILS & TROLLEYS.

HOISTS, Electric, hand, air 1 to 10 ton.

CONVEYOR—all sizes and types.

CRANES—overhead & jib, all sizes.

MOTORS, SPEED REDUCERS, BLOWERS—any size.

AIR COMPRESSORS—from 1 hp up.

FOUNDRY EQUIPMENT. Send us your inquiries.

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CINCINNATI 32, OHIO

FOR SALE
HYDRO-BLAST CLEANING SYSTEM

For dustless core removal, surface cleaning, sand recovery. Complete equipment as removed from large foundry discontinuing business. Used very little. Stored in San Francisco. For details communicate: H. W. SOULE CO., 2106 FORTY-SIXTH AVE., SAN FRANCISCO 16, CALIF. PHONE LOMBARD 6-2805.

FOR SALE
SAND BLAST EQUIPMENT

Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blade. Price 30% of list.

Wheelabrator #1 Tablast 4" dia. with tables, blower and dust collector—$3250.

Sand Blast Cabinets, pressure-tanks, dust collectors and blowers. All sizes.

2—Tumble air blast barrels, Model 1GF, cap. 150 lbs.

9 ft. LF Pangborn blast table. Like new.

Contact us for your sandblasting needs or any surplus sandblasting parts and equipment you have for sale.

1—36 x 42 Wheelabrator, with loader and dust collector, some spare parts.....$5000.00.

DIAMOND SALES INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

Tabor 22" x 42" shockless jolt, rollover molding machine with wheels and air clamps. Purchased August, 1950—used one week—clamps never uncrated. A real buy. If interested, write: P. O. BOX 256, WATERVILLE, MAINE.

For Sale

FOR SALE

MODEL No. 2A Climax wire straightener with motor. Handles 4 wire sizes—1/16" to ¼" inclusive. A complete unit ready for operation as soon as connected to current. In excellent working condition $600.00

ALLIED MACHINE CONTRACTORS
17 COURT ST. BUFFALO 2, NEW YORK

FOR SALE

1—#60 speed muller—Beardsley & Piper—complete

1—#2 Simpson intensive sand muller—complete

1—SPO #3102 stationary jolt lift machine, inverted jolt, with jolt timer—like new—never used.

ALL ITEMS FOR IMEDIATE DELIVERY

DONOVAN, INCORPORATED
1080 HAZEL AVENUE
ST. PAUL, MINNESOTA
PHONE VAN BUREN 5531

FOR SALE

Pangborn GJ-1 rotoblast and spare parts. 20 ton wheel press. Herman jolt rollover machine 6000# capacity with 28" draw.

AMERICAN FOUNDRY AND MACHINE CO.
P.O. BOX 300
SALT LAKE CITY, UTAH

FOR SALE

1—Ingersoll-Rand Type FS347, 4000 CFM 125 lbs pressure 3500 RPM direct connected motor driven centrifugal air blower with 30 HP, 220/3/60 motor and controls. Purchased new in 1944.

1—Ingersoll-Rand Type G motor blower 2200 CFM, 16 oz. pressure with 15 HP, 220/3/60 open motor. Purchased new in 1944 and never used.

BEDFORD FOUNDRY & MACHINE COMPANY
BEDFORD, INDIANA

FOR SALE

1—New Haven sand blast barrel complete with motor, size 36 x 42, in good condition.$450.00

1—New Haven sand blast barrel without motor, size 36 x 42 .....$275.00

1—24" x 48" tumbling barrel without motor $100.00

U. S. FOUNDRY CORP.
KALAMAZOO, MICHIGAN

FOR SALE

One used #200 Milwaukee briquetting press complete except for motors and starters. If interested contact: WORTHINGTON PUMP & MACHINERY CORP., BUFFALO WORKS, BUFFALO 5, NEW YORK.

FOR SALE

MOLDING MACHINE

1—60 B Milwaukee jolt rollover pattern draw molding machine.

2—Osborn No. 601 jolt rollover pattern draw molding machines.

1—Johnston & Jennings No. 918 jolt rollover pattern draw molding machine.

1—Osborn No. 403 jolt rollover pattern draw molding machine.

4—U. S. #2 model jolt squeeze pin lift machine, 8" draw, practically new.

SAND CUTTERS

1—Model AA American Wheelabrator sand cutter, gasoline driven, completely rebuilt.

1—Model AM American sandcutter, electric driven. Excellent condition.

CLEANING EQUIPMENT

1—American Wheelabrator tumblast 36 x 42. Excellent condition.

1—Sly 8 ft. diameter airless centriblast table. Excellent condition. Many spare parts.

MARCH-BROWNBACK CO.
POTTSTOWN, PA.

FOR SALE

MOLDING MACHINES

1—International 14 x 8 jolt rollover draw
1—International 24 x 12 core rollover draw
2—Deuscher Stationary jolt squeeze
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers

BLOWERS FOR CUPOLAS AND FURNACES

10—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
1—#47 Connersville-Acme
2—#59 Connersville-Acme
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.

Maxon-Premix Blowers for Gas ¼ to 1 HP

METAL MELTING EQUIPMENT

5—1000# open flame brass melting furnaces, gas fired
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired

New 32" to 41" dia. shell cupolas made to order.

TUMBLING MILLS AND SAND BLAST

1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room

MISCELLANEOUS

1—Gardner horizontal grinder 52" dia. wheel 20 HP motor
1—Stoney crane type shakeout
1—Dings type M magnetic separator
1—NC-4 sand separator
1—NB-2 sand separator
1—#1 Demmler core blower
1—American sand cutter 50" blade
1—2-Station Handy Sandy
1—#1 Blystone sand mixer, motor drive
2—#16 Roto-clone units complete
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
4000	32 oz.	Spencer	60	440/3/60	
3500	40 oz.	Spencer	60	440	1800
2700	16 oz.	Spencer	20	220/3/60	1750
650	16 oz.	Spencer	10	220/3/60	3600
550	20 oz.	Spencer	5	220/3/60	3475
450	40 oz.	Spencer	7½	220	1750
400	16 oz.	Spencer	3	220/3/60	3500

PRESSURE BLOWERS (3 Phase, 60 Cycle)

9100	7" SP	Sturtevant			1900
4500	16 oz.	G. E.	30	440	3600
2500	7 oz.	Sturtevant	15	220/440	1800
400	43 oz.	Spencer	2	220/3/60	3500
100	7" SP	Spencer	1	110/DC	3500
2700	16 oz.	Nth. Amer.	20	220/440	3600
800	8 oz.	Nth. Amer.	3	220	3600
660	20 oz.	AllenBillmyre	7½	440	3600
470	6 lb.	A&B	30	220/440	3450
340	20 oz.	AllenBillmyre	3	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

3—Fisher brass for #225 crucible gas fired tilting, complete with blower. Address: EXCELSIOR BRASS WORKS, 56 SHERIDAN ST., SAN FRANCISCO, CALIF.

FOR SALE

No. 2 American Wheelabrator multi table with 8-27 ¼" diameter, auxiliary tables practically new. Address: KNOXVILLE FOUNDRY COMPANY, KNOXVILLE, TENNESSEE.

FOR SALE

1—Whiting No. 8 cupola with Roots blower size 6 less motor, used.

J. I. CASE CO.
629 W. 10th ST. ANNISTON, ALABAMA

CLASSIFIED ADVERTISING

For Sale

FOR SALE

1—#400 Hausefeld Tilting Furnace
1—Stewart No. 5 Stationary Furnace
1—Eller Furnace made by Wolverine Fdry. Supply complete with Motor and Blower
3—Tilting Swing Head cover brass furnaces, No. 300 crucible
1—Pedestal Grinder with 5 HP. Motor
1—Covered Worm Geared Ladle, 1000 lb. cap., made by Modern Equip. Co.
1—Whiting Slag Ladle
1—Worm Geared Covered Ladle, 400 to 600 lb. for Pouring Device
1—10 Ton Whiting Worm Gear Ladle
2—1000 lb. Worm Gear Ladles
1—3000 lb. Worm Gear Ladle
2—2 Ton Worm Gear Ladles
2—4 Ton Worm Gear Ladles
1—6 Ton Worm Gear Ladle
1—7 Ton Worm Gear Ladle
1—1500 lb. Ladle and Shank
1—Blystone Sand Mixer complete with motor, gear driven
1—JFL International Power Jolt Foot Lift Machine
1—JDP International Jolt Stripper, 600 x 8
2—International "G" Machines 20 x 8
1—Osborn Bumper 24 x 36
1—International Jolt Squeezer
1—Tabor Hand Rollover Core Machine
1—International "R" Type 14 x 8 Machine
2—Tabor Rollover Machines, 30 x 40" tables.
2—24" Elec. Riddles
2—Gyratory Elec. Riddles
1—American Sand Cutter Machine Size 89/70 M
1—Royer Jr. Sand Conditioner
1—Model "S" Beardsley & Piper Screenarator

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO, MICH.

FOR SALE
IMMEDIATE DELIVERY

1—Ransohoff Cleaning Mill 48" x 72", Side Loading, Side Unloading—Star Return—with Sand Handling Conveyor complete with tank, pump, switches and motors.—Excellent Condition.

FOUNDRY HOIST

1—3 ton R & M 2 motor AC foundry hoist.

IMMEDIATE DELIVERY
AIR COMPRESSOR

1000 cfm Chicago Pneumatic 100# pressure 2300 or 440 v, A.C. 257 r.p.m. syn. mtr. Complete with starting equipment and all accessories.

DUQUESNE ELECTRIC & MFG. CO.
6428 HAMILTON AVE.
PITTSBURGH 6, PA.
TELEPHONE MO-1-5800

FOR SALE

2—International type "F" 27" x 12", Stationary
4—International type "G" 20" x 8", Portable
1—International Jolter, 16" x 24", Portable
2—Royer Size "D" Separators, Portable
1—Core Blower (San-Blo)
1—3-ton P & H 2 motor electric Hoist, 220 D. C.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

3—two million BTU — 2—400,000 BTU Dravo direct fired gas forced air space heaters. Burn either natural or LP gas. Convertible to oil. Excellent for large space heating.

LUTHE HARDWARE COMPANY

DES MOINES IOWA

FOR SALE

1—Used Pangborn EN2-sand blast cabinet complete with dust arrestor, good condition. $500.00 f.o.b. Webster City, Iowa. ADDRESS: McCOLLOUGH'S INC., WEBSTER CITY, IOWA.

FOR SALE

One No. 5 Modern Equipment Co. 63" shell cupola with charger and Ingersoll-Rand blower 4300 CFM at 1½ lbs. pressure. Operated six months. Make offer. Address: STA-RITE PRODUCTS, INC., DELAVAN, WISCONSIN.

For Sale

FOR SALE

MELTING UNIT

50 kw. Induction

Ajax 3,000 cycle

Complete

BOX 757

FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—Air compressor, Ingersoll Rand, 12 x 11 ES-1 horizontal, 310 CFM, complete with #3 class 18-PL-12 Aftercooler and receiver.

1—Car unloader, Barber-Green, model 358, complete with pneumatic tires, towing hitch, horizontal plates for foundry coke.

1—Swing grinder, Momert-Dixon, 10 HP motor.

1—Spencer blower, capacity 9000 CFM at 24 oz. pressure, 100 HP motor and starter.

ALL ITEMS FOR IMMEDIATE DELIVERY

DONOVAN, INCORPORATED
1080 HAZEL AVENUE
ST. PAUL, MINNESOTA
PHONE VAN BUREN 5531

FOR SALE

ELECTRIC FURNACE TRANSFORMER

200 KVA, West., HV 307/120, LV 120/60, three ph., 60 cy., OISC, with taps.

INDUCTION VOLTAGE REGULATOR

100 KVA, West., prim. 230/3/60, sec. 153/307, 750 amps, 33-1/3% reg., OISC. Will reconnect to 440 V.

Like new—never installed.

DELL STEPHENSON & CO.

14456 GLASTONBURY DETROIT 23, MICH.

TELEPHONE VERMONT 5-0697

FOR SALE

50 KW Ajax induction melting furnace, complete. Can melt 250 pound heats, equipment in excellent condition and can be seen in operation, melting stainless and heat resistant alloys. Address: MIDWEST ALLOYS, INC., 1200 NORTH ROCK HILL RD., ST. LOUIS 17, MISSOURI.

FOR SALE

2—30 HP U.S. Syncrogear Motors 220/440/3/60 ratio 5.07, Geared Speed 350 RPM.

1—5 HP U.S. Syncrogear Motor 220/440/3/60 ratio 13.5, Geared Speed 135 RPM.

Also other motors and pumps from practically new HydroBlast System.

KULKA INDUSTRIAL CORPORATION

ALLIANCE, OHIO

PHONE 6255

FOUNDRY EQUIPMENT FOR SALE

1—No. 4 Whiting Cupola with all parts except stack. Never used.
1—Plain-jar Power Draw type machine #28144 with adjustable flask lifting pins.
1—Magnetic separator for brass borings.
2—Reellites for electric hoist. 3 volt king capacity. One never used.
1—type BM 75887 Sandblast Cabinet size 2C.
2—Adams jolt squeeze machines.
1—400# Reda furnace, like new.
1—Middle size Royer.
3—Arcade squeezers.
1—Gardner Rix Air Compressor. Size 4½" Bore—Stroke 4½".
1—12' 12" screw with 5 HP motor and reduction drive.
1—3 x 5 Simplicity shake out, complete with motor, pulley and drive belts.

Conveyor No. 1. E E Feeder

2—11' long conveyors with 20" wide belt, equipped with 1 HP motor with geared head, speed reducer, belt speed 24 FPM.

Conveyor No. 2. A A Tempering

2—36' long conveyors with 20" wide belt, equipped with 3 HP motor and magnetic head pulley 18" Dia., 24" wide belt. Speed 150 FPM.

Conveyor No. 3, BB

2—20' long conveyors with 20" wide belt equipped with 2 HP motor, belt speed 150 FPM.

Conveyor No. 4

2—93' long conveyors with 20" wide belt equipped with 3 HP motors and 4 plows. Belt speed 150 FPM.

The above Conveyor equipment manufactured by Trowbridge Company, Clifton, New Jersey. It has never been uncrated.

SERVICE BRASS & ALUM. FDRY.
340 NORTH MOSLEY
WICHITA, KANSAS
PHONE 7-9215

FLASKS

Sterling Wheelbarrow Rolled Steel Flasks
20 sets 46 x 50—6" cope, 6" drag
19 sets 38 x 44—6" cope, 6" drag
20 sets 32 x 48—6" cope, 6" drag
20 sets 32 x 48—6" cope, 8" drag
also 10 sets 48 x 32 Steel, 5" cope, 5" drag
10 sets 28 x 22 Steel, 5" cope, 5" drag
21 sets 62 x 41 x 31 Magnesium, 5" cope, 9" drag
2 sets 48 x 32 Magnesium, 5" cope, 5" drag
1 set 28 x 22 Magnesium, 5" cope, 4" drag

CONVEYOR
ALL SIZES AND TYPES

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CINCINNATI 32, OHIO

FOR SALE

Extra heavy soil pipe fitting patterns, meeting all specifications. Tons of castings have been produced from these patterns. All types molding machines, core blowers, pattern plates, vibrators, general foundry equipment and pattern shop equipment. All priced for quick sale. Let us know your requirements. Address: Box 723, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Cast iron sectional gas fired boiler patterns—with jigs and all tooling and some stock. Very compact unit. Address: MR. A. ROMANO, 221 HERBERT ST., ALTON, ILLINOIS.

SOIL PIPE AND FITTING EQUIPMENT

Assorted patterns, arbors, pipe machines and other equipment necessary for the manufacture of soil pipe and soil pipe fittings. Address: J. F. QUEST FOUNDRY CO., 900 S. 4th ST., MINNEAPOLIS 15, MINN.

FOR SALE

20 Foundry moulder hoppers, like new. 1—large Whiting cupola (#7) erected furnace. Address: EASTERN STATES STEEL PRODUCTS CORP., 36 COOK STREET, EAST BRIDGEWATER, MASS.

BLOWER
FOR SALE

1—#5½ figure 8 Impeller Type Roots-Connersville Blower less motor. Designed for 28.2 CFR at maximum speed of 220 RPM and 16 oz. pressure or 5600 CFM.

BEDFORD FOUNDRY & MACHINE COMPANY
BEDFORD, INDIANA

PARTIAL PLANT LIQUIDATION

TOOLS BLDGS. & CRANES EQUIPMENT

1—48″ Niles Vertical Wheel Lathe #19709
1—48″ Niles Vertical Wheel Lathe #20977
1—48″ Niles Double Head cut-off Vertical Lathe #20980
5—Single Fox Ped. Grinders 2″x24″
3—Fox Automatic Chain Grinders
1—No. 4 Gardner #4 Ped. Grinders
2—Heavy Pedestal Grinders
1—Baker Battery Lift Truck
1—Reading Mono Hoist
1—Cleveland Tramm Hoist
1—Gantry charging crane 4½ ton

Large assortment of new and used steel buildings with coverings, windows, etc. Tell us your requirements and we will advise you of what we have nearest. Also, we have several desirable cranes and extra trolleys.

1—Greenfield Blower & 50 HP motor
2—Bart. & Snow Wet Dust Collectors
1—Stripper
1—Furnace pusher
7—25 ton ladles
18—54″ & 60″ wheel spinning machines
1—5F—Reeves Reducer
1—New Jones spur Reducer 72 to 1
1—18″ Jaw crusher
1—½ yd. Jaeger Elec. Mixer
1—Conveyor chain take-up

HETZ CONSTRUCTORS, INC.

P. O. BOX 671 WARREN, OHIO
PHONE, NILES, OHIO 2-2509

LIQUIDATORS — APPRAISERS — AUCTIONEERS

FOR SALE

2—24″x30′ Belt Conveyors, 5 H.P. 220/440V. 3ph. 60 cy.
1—Bartlett & Snow Bucket Elevator, 60 ft. high, buckets 5″x7½″x4½″ mounted on heavy chain, 5 H.P. 220/440 V. 3 ph. 60 cy.
1—Bartlett & Snow Chain Conveyor, 58 ft. lg. 6″ wide, 7½ HP. 220/440V.
2—#405-79 Osborn Rollover and Pattern Draw Molding Machines
1—147-1 Osborn Rockover and Draw Machine, for long jobs.
1—Herman Rollover Molding Machine 22″ cyl 42″x72″ table
1—Herman Bumper ser. #1458, 7000# jolt cap. 40″x58″ table
1—Herman Rollover floor type 20″x42″ 750# jolt capacity
1—Herman Jarring Stripper Molding Machine 40″x72″ table 20″ draw
5—#103-5 Milwaukee Jolt Squeeze Molding Machines
1—#2 Demmler Core Blower—New
4—SB12 International Core Blowers
1—Pangborn 28 cu ft. Rotoblast, Type CK with power loader.
1—Pangborn 12 ft. dia. Tableblast complete with dust collector.
1—Dust Collector, Parsons #118 complete with 20 H.P. motor & blower.
4—Tumbling Mills, 30″x60″ with 15 H.P. motor 220/440V. 3ph. 60cy.
1—10 H.P. Black & Decker double stand grinder 440V. 3-h. 60cy.
1—3 H.P. double stand grinder belt driven.
1—40 H.P. Pennsylvania Air Compressor
1—60 H.P. Ingersoll-Rand Air Compressor
1—100 H.P. Chicago-Pneumatic Air Compressor
1—#5 Cupola
1—#9 Cupola
1—Beardsley-Piper Speedmuller #60, 19 to 38 tons per hour.
1—Beardsley-Piper "Junior" track type sandslinger
1—Beardsley-Piper Stationary type sandslinger
2—3 H.P. Blowers for furnaces
1—5 H.P. Blowers for furnaces
1—15 H.P. Blowers for furnaces
2—Micromax Instruments Leeds & Northrup Temperature Control.
Various sizes of used steel flasks
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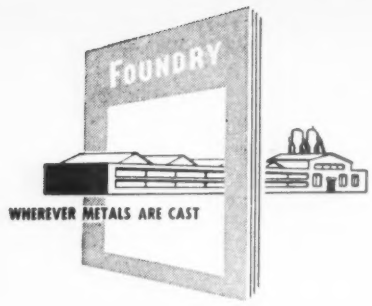

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FOUNDRY
PRE-CONVENTION ISSUE

MAY 1952

Mailed to reach foundrymen one week prior to opening of the 1952 Convention. This issue will also be distributed at the Convention.

ADVERTISING FORMS CLOSE MARCH 25, 1952

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JUNE 1952

Will report in word and picture the convention itself —always an interesting, readable issue.

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Your opinion expressed in answering the following questions will help us to serve you better. BIG things often result from little suggestions. May we have your comment?

THANK YOU! . . . . . FOUNDRY

Are YOU a Thumber?

- ☐ I start from the *front* and thumb through the issue until I find something of interest.
- ☐ No, I usually start from the *back* and work my way toward the front of the magazine.
- ☐ As a matter of fact, I consult your *Table of Contents* and start from there.

Do you have some Favorites?

I usually read the regular departments checked:

- ☐ With the Editors column.
- ☐ Frank Steinebach's Editorial.
- ☐ Letters to the Editor.
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- ☐ ABC of Foundry Practice.
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You're WELCOME!

You may return the favor of my comments by sending me gratis a copy of Ed Bremer's 32-page GLOSSARY OF FOUNDRY TERMS.

Name and Address (optional) _____

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★ *Thank You for participating in our opinion-poll. Please return this to* FOUNDRY, *1213 W. 3rd St., Cleveland* 13, *Ohio.*

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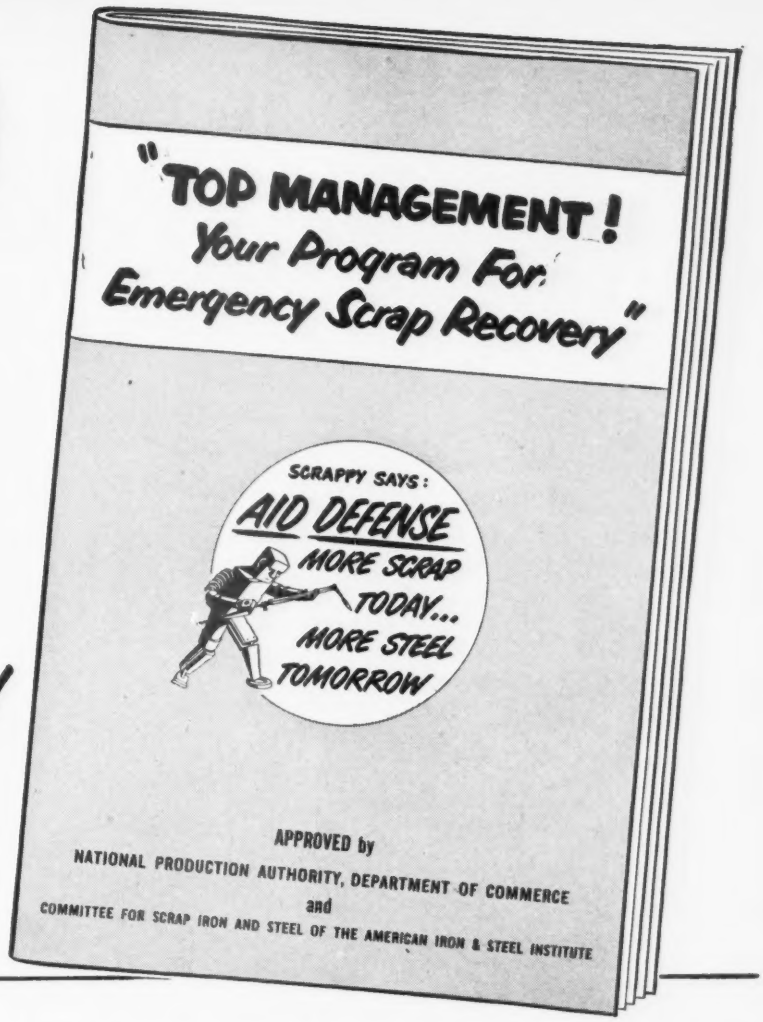
What YOU can do... Must do

to ease the critical iron and steel scrap problem



It's a problem calling for the assistance of every thoughtful business man—now.

Unless the steel mills get more scrap . . . furnaces may have to be shut down.

Shut down—at a time when our armed forces need more and more equipment . . . when civilian demands for steel are greater than ever . . . when our economy is fighting desperately against inflation!

You Can Help. Yes . . . regardless of the business you're in . . . you're in the scrap business, too.

If you're in the steel-fabricating business, you have extra *dormant* scrap to be added to your *production* scrap.

If you're in any other business, you surely have idle metal that will do you—and America—more good being fed into furnaces than cluttering up your premises.

Write for Suggestions. The booklet shown here tells how to set up a Scrap Salvage Program with least amount of effort and minimum interference with your regular operation. It tells where to look for scrap, what to do with it when you get it.

You are urged to send for the booklet now. Use the coupon.

FACTS ABOUT SCRAP SALVAGE

Steel production	1950 — 97,800,000 net tons
Estimated capacity	1952 — 119,500,000 net tons
Purchased scrap used*	1950 — 29,500,000 gross tons
Estimated purchased scrap requirement*	1952 — 36,200,000 gross tons

*All consumers

Where will the extra tonnage come from? Mostly from your *dormant* metal—obsolete machines and structures, tools, jigs, fixtures, gears, wheels, chains, track.

NON FERROUS METAL NEEDED, TOO:

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

This advertisement is a contribution, in the national interest, by

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New York 19, N. Y.

Please send me a copy of the free booklet: "Top Management: Your Program for Emergency Scrap Recovery".

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COMPANY.....TITLE.....

ADDRESS.....

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300 molds on their way to the shake-out at Otis Elevator, Yonkers, N. Y. MODERN cranes, monorail, pouring devices and ladles are synchronized for fast, high-production pouring.

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and on a man-per-hour basis both foundries are pouring approximately the same volume of metal.

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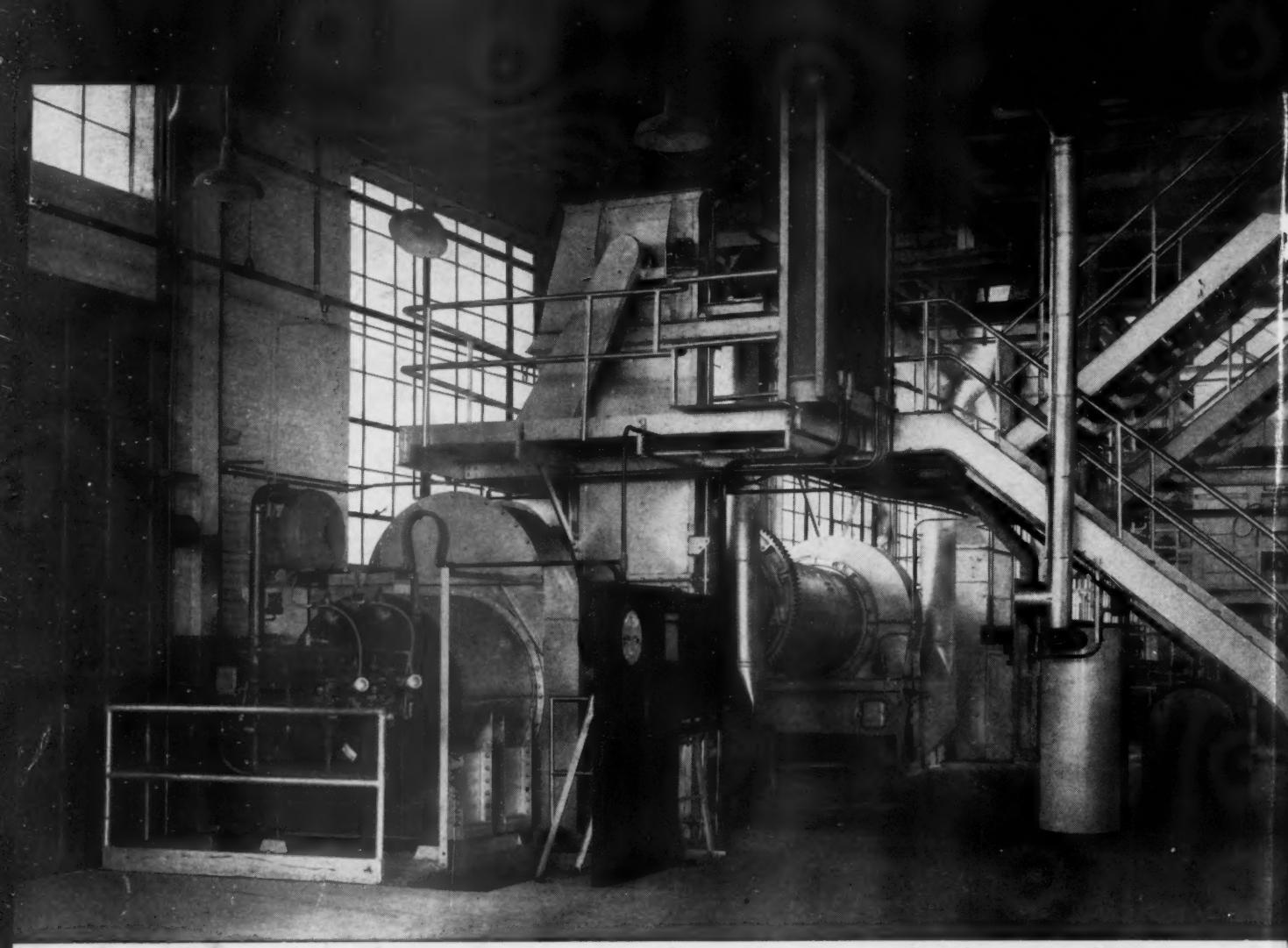

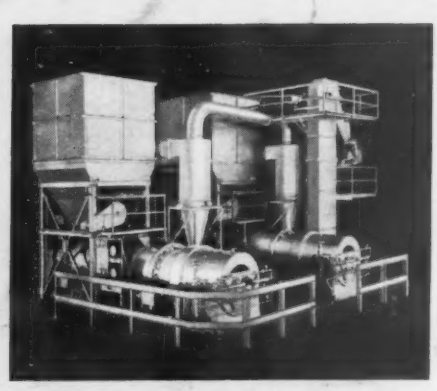

Complete Sand Drying and Handling Equipment Showing Discharge of Dried Sand to Core Room.

View in Core Room Showing Continuous Car Type Conveyor That Carries Cores to Ovens.

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cuts core costs

● Drying your own core sand results in better deliveries and lower sand costs. It permits exact duplication of every mix — saves on binders — results in a uniform bake — constant core structure and reduces losses of both cores and castings.

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